Independent Practice

Circle the correct answer or answers to solve the problems.
You can use a model to help.

MP6 **5.** Carrie uses fishing wire to make beaded necklaces. She uses $1\frac{3}{4}$ feet of wire to make one necklace. How much wire does Carrie need to make 5 necklaces?

a. $3\frac{3}{4}$ feet

b. $6\frac{3}{4}$ feet

c. $8\frac{3}{4}$ feet

d. 9 feet

MP4 **6.** About $\frac{6}{100}$ of the people in the United States are less than 5 years old. Four times as many people are less than 18 years old. What fraction of the people in the U.S. are less than 18 years old?

a. $\frac{13}{100}$

b. $\frac{18}{100}$

c. $\frac{20}{100}$

d. $\frac{24}{100}$

MP1 **7.** Andrew runs around a $\frac{1}{4}$-mile track 6 times. Which of the following do NOT describe the total number of miles Andrew runs?

a. $1\frac{1}{4}$ miles

b. $1\frac{1}{2}$ miles

c. between 1 and 2 miles

d. more than 2 miles

MP2 **8.** There are 4 quarts in 1 gallon. Marlon is trying to find out how many quarts of milk are in six $\frac{1}{2}$-gallon cartons. Which of the following does NOT represent the total number of quarts of milk?

a. $6 \times \frac{1}{2}$

b. 4×3

c. $4 \times (6 \times \frac{1}{2})$

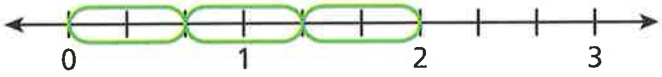
d. $24 \times \frac{1}{2}$

Explain your answer.

Independent Practice

MP2 **9.** Why is the product of 6 and $\frac{11}{12}$ less than 6? Is the product of a whole number and a fraction always less than the whole number?

MP4 **10.** What multiplication example does the model show? Write and solve a word problem that the model could represent.



Solve the problems.

MP5 **11.** Daniella is using the length of her hand to measure the width of her desk. Her hand is $\frac{5}{12}$ feet long. The width of her desk is 7 lengths of her hand. How many feet wide is Daniella's desk?

Show your work.

Answer ____________________

MP6 **12.** Brad is making popcorn in the microwave. It takes $3\frac{3}{4}$ minutes to pop one bag of popcorn. How long will Brad take to pop 4 bags, one at a time?

Show your work.

Answer ____________________

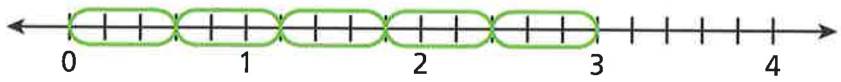
Independent Practice

MP1 **13.** Chelsea buys 3 bags of cherries that each weighs $\frac{3}{4}$ of a pound. Her sister buys 4 bags of cherries that each weighs $\frac{1}{2}$ of a pound. Who buys more pounds of cherries?

Show your work.

Answer ______________________________

MP4 **14.** Angela needs $\frac{3}{4}$ cup of milk for each batch of pancakes she makes. She draws the model below to find the amount of milk she needs to make 5 batches.



Is Angela's model correct?

Answer ______________________________

Justify your answer using words, drawings, or numbers.

MP8 **15.** Kenny knows that it takes him 13 minutes to walk 1 mile. His friend lives $2\frac{7}{8}$ miles away. Kenny writes the equation below to find out how long it will take to walk to his friend's house.

$$13 \times 2\frac{7}{8} = 13 \times (2 + \frac{7}{8}) = (13 \times 2) + \frac{13 \times 7}{8}$$

Can Kenny find the correct number of minutes with this method? Use Kenny's or a different method to solve the problem.

Answer ______________________________

Justify your answer using words, drawings, or numbers.

Lesson

24 Add Fractions: Denominators of 10 and 100

Essential Question:
How can you use the relationship between 10 and 100 to add tenths and hundredths?
4.NF.5

Words to Know:
tenth
hundredth

Guided Instruction

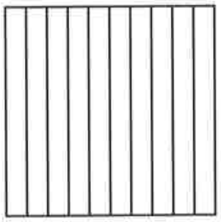
In this lesson you will learn how to write equivalent fractions so that you can add fractions with denominators of 10 and 100.

Understand: Tenths and hundredths of a whole

One dollar equals 10 dimes or 100 pennies. If Carla has 6 dimes, how many tenths of a dollar does she have? If she has 6 pennies, how many hundredths of a dollar does she have?

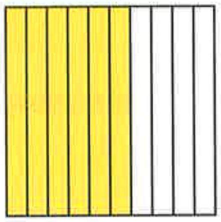
To represent dimes and pennies as fractions of a dollar, you can use 10 and 100 as denominators.

First, model the 10 dimes in 1 dollar.
Use 1 whole partitioned into 10 equal parts.
Each part is 1 tenth, or $\frac{1}{10}$, of the whole.



$\frac{10}{10} = 1$

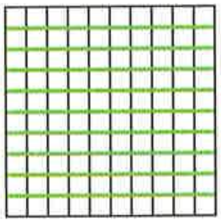
To show 6 dimes, shade 6 tenths in the model.
Write the fraction for the shaded part.



$\frac{6}{10}$

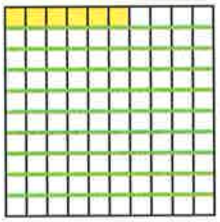
Six dimes is $\frac{6}{10}$ of a dollar.

Now model the 100 pennies in 1 dollar.
Use 1 whole partitioned into 100 equal parts.
Each part is 1 hundredth, or $\frac{1}{100}$, of the whole.



$\frac{100}{100} = 1$

To show 6 pennies, shade 6 hundredths in the model.
Write the fraction for the shaded part.



$\frac{6}{100}$

Six pennies is $\frac{6}{100}$ of a dollar.

➡ If Carla has 6 dimes, she has 6 tenths of a dollar. If Carla has 6 pennies, she has 6 hundredths of a dollar.

Guided Instruction

Understand: Equivalent tenths and hundredths of dollars

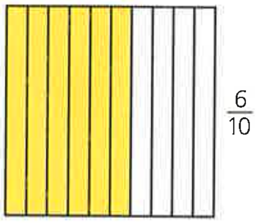
Carla wants to exchange her 6 dimes for pennies. How many pennies will Carla get that equal 6 dimes?

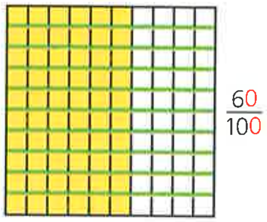
You can rename tenths as hundredths the same way you write other equivalent fractions.
Look at the 6 tenths model below. Shade the same area of the hundredths model. How many hundredths did you shade? 60 hundredths
You can partition each tenth into 10 equal parts to make hundredths.
1 tenth equals 10 hundredths.

$$\frac{1}{10} = \frac{10 \times 1}{10 \times 10} = \frac{10}{100}$$

6 tenths equals 60 hundredths.

$$\frac{6}{10} = \frac{10 \times 6}{10 \times 10} = \frac{60}{100}$$





Since 1 hundredth dollar is 1 penny, 60 hundredths dollar is 60 pennies.
So, 6 dimes equal 60 pennies.

➡ Carla will get 60 pennies for 6 dimes.

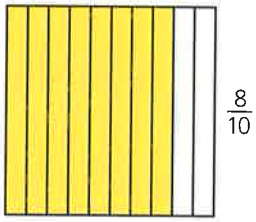
Understand: Addition of tenths and hundredths when the whole is a dollar

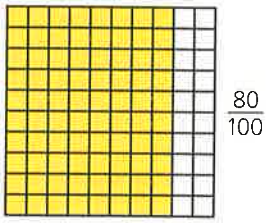
One dollar equals 100 cents. Jason has $\frac{8}{10}$ dollar in dimes and $\frac{15}{100}$ dollar in pennies. How many cents does Jason have altogether?

To find the total number of cents, rename the tenths as hundredths and then add.
Model the 8 tenths of a dollar.
Write an equivalent fraction for $\frac{8}{10}$ using 100 as the denominator.

$$\frac{8}{10} = \frac{10 \times 8}{10 \times 10} = \frac{80}{100}$$

8 tenths equals 80 hundredths.





$\frac{80}{100}$ and $\frac{15}{100}$ have like denominators, so you can add the hundredths.

8 dimes 15 pennies

$$\frac{80}{100} + \frac{15}{100} = \frac{95}{100}$$

One hundredth of a dollar is 1 cent, so 95 hundredths of a dollar is 95 cents.

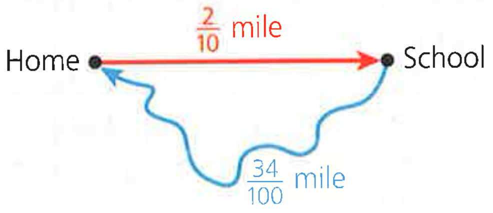
Remember!
To add fractions with like denominators, add the numerators.

➡ Jason has 95 cents altogether.

Guided Instruction

Connect: Adding tenths and hundredths when the whole is not a dollar

Every school day, Maria walks to school in the morning and walks back home in the afternoon. When she walks to school in the morning, she takes a direct route which is $\frac{2}{10}$ mile. When she walks home, she takes a different route that goes along a jogging trail. That route is $\frac{34}{100}$ mile. How far does Maria walk each day during her trip to and from school?

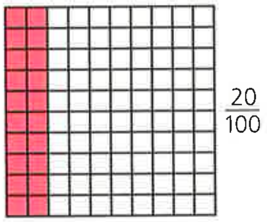


In this problem, the whole is 1 mile. You can add fractions of a mile just like you added fractions of a dollar.

Step 1

Rename $\frac{2}{10}$ as hundredths.
Write an equivalent fraction using 100 as the denominator.

$$\frac{2}{10} = \frac{10 \times 2}{10 \times 10} = \frac{20}{100}$$

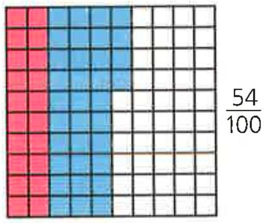


Step 2

Now add $\frac{20}{100}$ and $\frac{34}{100}$.

$$\frac{20}{100} + \frac{34}{100} = \frac{20 + 34}{100} = \frac{54}{100}$$

➡ Maria walks $\frac{54}{100}$ mile during her trip to and from school.

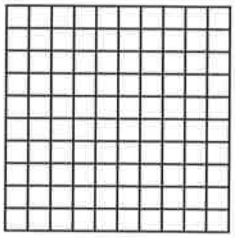


Does Maria walk more or less than $\frac{1}{2}$ mile during her trip to and from school? How did you decide?

Guided Practice

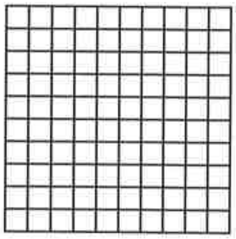
Color the model to show the tenths. Then rename the tenths as an equivalent number of hundredths.

1. 1 tenth



$\frac{1}{10} = \frac{10 \times \underline{\quad}}{10 \times \underline{\quad}} = \frac{\underline{\quad}}{100}$

2. 5 tenths



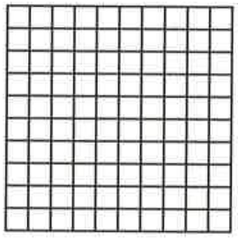
$\frac{5}{10} = \frac{10 \times \underline{\quad}}{10 \times \underline{\quad}} = \frac{\underline{\quad}}{100}$

Rename the tenths as an equivalent fraction with a denominator of 100. Add. Use the model to show the addition.

3. 3 tenths + 42 hundredths

$\frac{3}{10} = \underline{\qquad\qquad}$

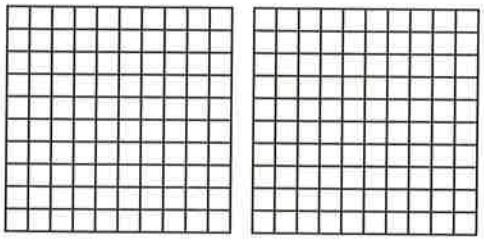
$\frac{\underline{\quad}}{100} + \frac{\underline{\quad}}{100} = \frac{\underline{\quad}}{100}$



4. 20 hundredths + 11 tenths

$\frac{11}{10} = \underline{\qquad\qquad}$

$\frac{\underline{\quad}}{100} + \frac{\underline{\quad}}{100} = \frac{\underline{\quad}}{100}$



Think • Pair • Share

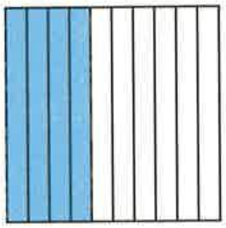
MP7 **5.** Look at exercise 4 above. What is another way to write 11 tenths? What is another way to write 20 hundredths? Use your model to help you.

Lesson 24 Add Fractions: Denominators of 10 and 100

Independent Practice

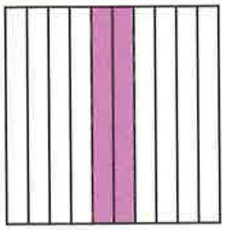
Look at the model. Name the fraction shown. Rename using equivalent fractions.

1.



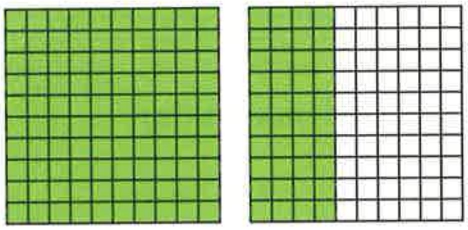
$\frac{\underline{\quad}}{10} = \frac{10 \times \underline{\quad}}{10 \times \underline{\quad}} = \frac{\underline{\quad}}{100}$

2.



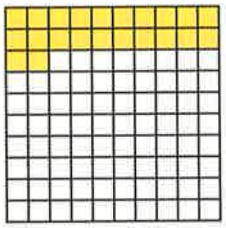
$\frac{\underline{\quad}}{10} = \frac{10 \times \underline{\quad}}{10 \times \underline{\quad}} = \frac{\underline{\quad}}{100}$

3.



$\frac{\underline{\quad}}{100} = \frac{\underline{\quad}}{10}$

4.



$\frac{\underline{\quad}}{100} = \frac{20}{100} + \frac{\underline{\quad}}{100} = \frac{\underline{\quad}}{10} + \frac{2}{100}$

Rename the tenths as hundredths.

5. 7 tenths = ____ hundredths

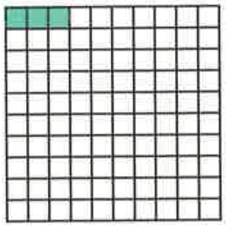
$\frac{7}{10} = \underline{\quad\quad}$

6. 9 tenths = ____ hundredths

$\underline{\quad\quad} = \underline{\quad\quad}$

Circle the correct answer.

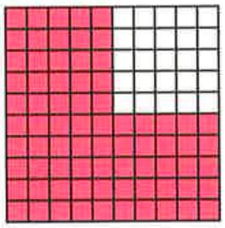
7. Which fraction is modeled below?



a. $\frac{3}{100}$ **b.** $\frac{30}{100}$

c. $\frac{3}{10}$ **d.** $\frac{30}{10}$

8. Which of the following is NOT equivalent to the fraction in the model?



a. $\frac{75}{100}$ **b.** $\frac{75}{10}$

c. $\frac{5}{10} + \frac{25}{100}$ **d.** $\frac{50}{100} + \frac{25}{100}$

Independent Practice

Use equivalent fractions to find each sum. Show your work.

9. $\frac{1}{10} + \frac{1}{100}$

10. $\frac{4}{10} + \frac{14}{100}$

Answer ________________

Answer ________________

11. $\frac{50}{100} + \frac{8}{10}$

12. $\frac{5}{10} + \frac{85}{100} + \frac{6}{10}$

Answer ________________

Answer ________________

13. In exercises 9–12, which sums are greater than 1?

____

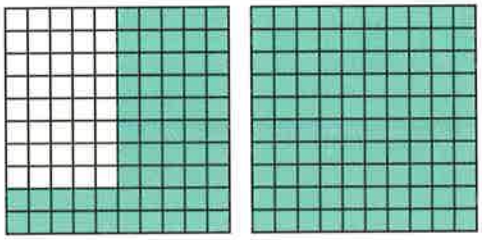
Draw lines to match each addition exercise with the correct sum.

14. 7 hundredths + 7 tenths	**a.** $\frac{177}{100}$
15. 7 tenths + 70 hundredths	**b.** $\frac{91}{100}$
16. 1 tenth + 17 hundredths	**c.** $\frac{140}{100}$
17. 10 tenths + 4 hundredths	**d.** $\frac{77}{100}$
18. 7 hundredths + 17 tenths	**e.** $\frac{27}{100}$
19. 11 hundredths + 8 tenths	**f.** $\frac{104}{100}$

Independent Practice

MP7 **20.** What is the relationship between tenths and hundredths? Discuss both the number of parts in 1 whole and the size of each part.

MP4 **21.** Lily says that the amount modeled below can only be broken apart and written as a sum of hundredths. Do you agree with Lily? Write this amount as a sum of two addends.



For problems 22 and 23, use the table at the right.

MP1 **22.** Curtis buys a book and gets pennies back in change. The pennies have the same value as 5 dimes. How many pennies does Curtis get?

Show your work.

Money Amounts	
Coin	**Fraction of 1 Dollar**
Dime	$\frac{1}{10}$
Penny	$\frac{1}{100}$

Answer ____________________________

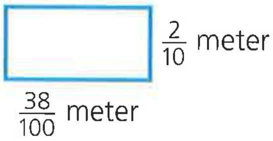
MP6 **23.** A cashier at a store counts the change in the register drawer. She has 3 dimes and 12 pennies. What is the total fraction of a dollar for these coins?

Show your work.

Answer ____________________________

Independent Practice

For problems 24–26, use the diagram at the right.



MP5 **24.** Tara is using wood to make a picture frame. The diagram shows the lengths of the pieces of wood she needs to make each side. She wants to know how much longer the bottom side of the picture frame is than the right side. She writes this equation to find the difference between the two lengths. $\frac{2}{10} + x = \frac{38}{100}$

What is the difference between the two lengths?

Show your work.

Answer ____________________

MP1 **25.** Tara bought 1 meter of wood to make the picture frame. Does Tara have enough wood for all four sides of the picture frame?

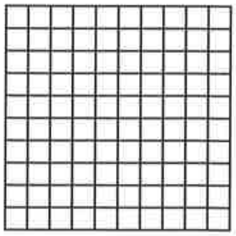
Answer ____________________

Justify your answer using words, drawings, or numbers.

MP3 **26.** Geoffrey says that Tara should rename the lengths of the bottom and top of the picture frame as tenths instead of hundredths. He thinks this will make it easier to measure the correct lengths. Do you agree with Geoffrey? You can use the hundredths model below to explain.

Answer ____________________

Justify your answer using words, drawings, or numbers.



Lesson
25 Write and Compare Decimal Fractions

Essential Question:
How can you use place value to write and compare tenths and hundredths?
4.NF.6; 4.NF.7

Words to Know:
decimal
decimal point

Guided Instruction

In this lesson you will learn how to write and compare decimal numbers for tenths and hundredths.

Understand: Equivalent decimals and fractions for tenths

Matt is making a cage for his hamster. The directions say to make the cage 0.7 meter long. Matt says this is the same as $\frac{7}{10}$ meter. Is Matt correct? Do 0.7 and $\frac{7}{10}$ name the same number?

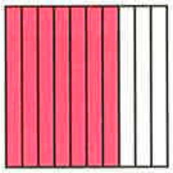
A decimal fraction, or decimal, is a number that uses place value and a decimal point. You can also write a decimal as a fraction with a denominator of 10 or 100. The decimal point separates the whole-number part (which may be 0) and the part less than 1.

0.7
decimal point

You can use a fraction or a decimal to name the same number of tenths. Compare the model and the place-value chart.

The fraction $\frac{7}{10}$ names 7 tenths of the whole.

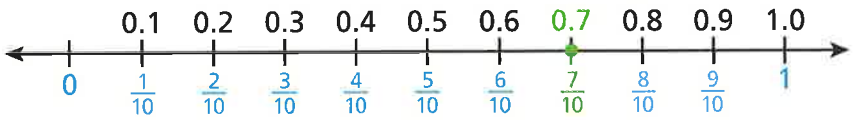
7 of the $\frac{1}{10}$-size parts are shaded.



tens	ones	.	tenths	hundredths
	0	.	7	

The decimal 0.7 also names 7 tenths, with the digit 7 in the tenths place. The tenths place is to the right of the ones and the decimal point.

You can use the same point on a number line diagram to represent $\frac{7}{10}$ and 0.7.



You can also read the numbers the same way.

seven tenths = 7 tenths = $\frac{7}{10}$ = 0.7

Yes, Matt is correct. 0.7 and $\frac{7}{10}$ name the same number, seven tenths.

- What do you think the number 1.7 means?

Guided Instruction

Understand: Equivalent decimals and fractions for hundredths

One side of Matt's hamster cage is too long. It measures 0.79 meter instead of 0.7 meter. What equivalent fraction represents the length 0.79 meter?

To understand the decimal 0.79, use place value to write an equivalent fraction and model the amount.

Remember! The value of each place is $\frac{1}{10}$ the value of the place to the left.

Look at 0.79 in a place-value chart.

tens	ones	.	tenths	hundredths
	0	.	7	9

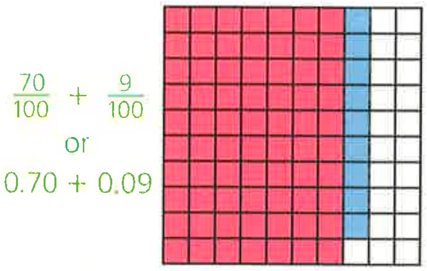
The 7 in the tenths place names 7 tenths, or 0.7.
The 9 in the hundredths place names 9 hundredths, or 0.09.

As with fractions, you can rename the decimal 7 tenths as 70 hundredths.

$$0.7 = \frac{7}{10} = \frac{10 \times 7}{10 \times 10} = \frac{70}{100} = 0.70$$

Now add 9 hundredths.

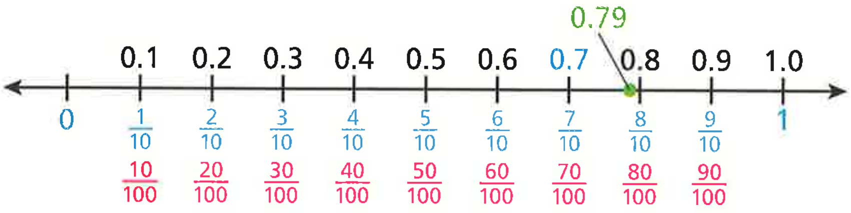
0.70 + 0.09 = 0.79


$\frac{70}{100} + \frac{9}{100}$
or
0.70 + 0.09

So altogether, 0.79 is equivalent to 79 hundredths, or *seventy-nine hundredths*. The equivalent fraction is $\frac{79}{100}$.

The equivalent fraction that represents 0.79 meter is $\frac{79}{100}$ meter.

Look at the number line below. The decimal 0.79, or $\frac{79}{100}$, is just 1 hundredth less than $\frac{80}{100}$. This means it is a little to the left of $\frac{80}{100}$ on the number line.


0.79
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
0
$\frac{1}{10}$ $\frac{10}{100}$
$\frac{2}{10}$ $\frac{20}{100}$
$\frac{3}{10}$ $\frac{30}{100}$
$\frac{4}{10}$ $\frac{40}{100}$
$\frac{5}{10}$ $\frac{50}{100}$
$\frac{6}{10}$ $\frac{60}{100}$
$\frac{7}{10}$ $\frac{70}{100}$
$\frac{8}{10}$ $\frac{80}{100}$
$\frac{9}{10}$ $\frac{90}{100}$
1

Write both $\frac{79}{100}$ and 0.79 as sums of tenths and hundredths.

Guided Instruction

Connect: Comparing decimal tenths and hundredths

Carmen wants to find the shortest way to the museum. She calls for directions and someone at the museum says one route is about four and three tenths miles long. A map website shows a different route that is 4.05 miles long. Which route is shorter?

First write both numbers as decimals. Then make models and use equivalent fractions to help you compare the two decimals.

Step 1

Write "four and three tenths" as a decimal. The "and" tells you where to place the decimal point.

$4.3 = 4\frac{3}{10}$

four and three tenths

4.3

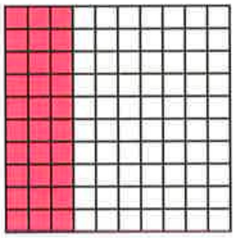
Step 2

Make sure the decimals name parts of the same unit or whole amount. In this problem, the unit, or whole amount, is 1 mile. 4.3 and 4.05 are both numbers of miles, so you can compare them.

Remember!
Tenths and *hundredths* are parts of a whole.

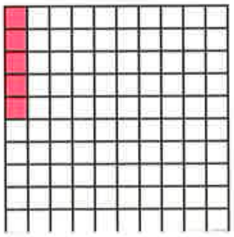
Step 3

Now compare the numbers. Both decimals have 4 as a whole number amount, so you can model just the tenths and hundredths.



$4.3 > 4.05$

$4.30 > 4.05$



$0.3 = \frac{3}{10} = \frac{30}{100}$; $0.05 = \frac{5}{100}$

$\frac{30}{100} > \frac{5}{100}$ and $0.3 > 0.05$

$4.3 > 4.05$

➡ The route from the map website is shorter.

You can also line up 4.3 and 4.05 by their decimal points and compare them as you compare whole numbers. Compare the values of the digits in the first place where they are different.

tens	ones	.	tenths	hundredths
	4	.	3	
	4	.	0	5

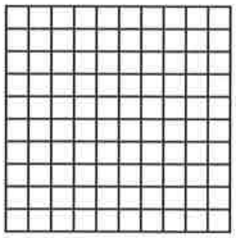
3 tenths > 0 tenths, so $4.3 > 4.05$.

How much shorter is the website's route?

Guided Practice

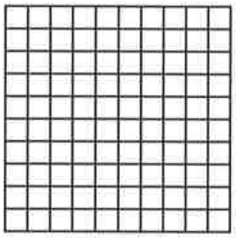
Color the model to show each amount. Then write the amount as both a fraction and a decimal.

1. 6 tenths



$\frac{6}{\quad} = 0.$____

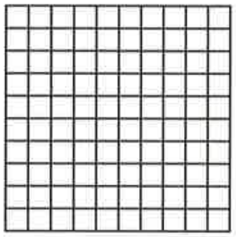
2. 8 hundredths



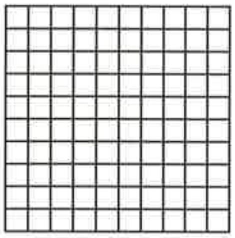
$\frac{8}{\quad} = 0.$____

Color the models to show the decimals. Then write <, =, or > to compare.

3. 0.52



0.9



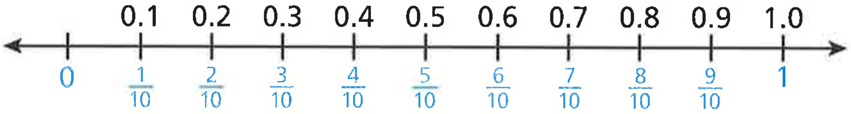
0.52 ____ 0.9

What is the first place where the digits are different?

____

Label points on the number line diagram to show the decimals. Then write <, =, or > to compare.

4. 0.21 and 0.29



0.21 ____ 0.29

What is the first place where the digits are different?

____

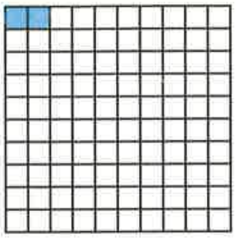
Think • Pair • Share

MP5 **5.** Look at exercise 3 above. Explain how the place values of the digits in 0.52 and 0.9 relate to the models, and show which decimal is greater. Discuss the number and values of the digits.

Independent Practice

Identify the amount as a number of tenths or hundredths. Then write an equivalent fraction and decimal.

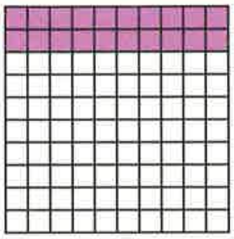
1.



2 ______________

$\frac{2}{\_\_}$ = 0.____

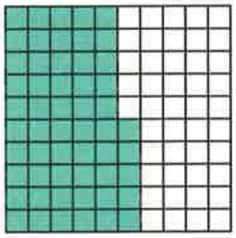
2.



____ tenths

— = 0.____

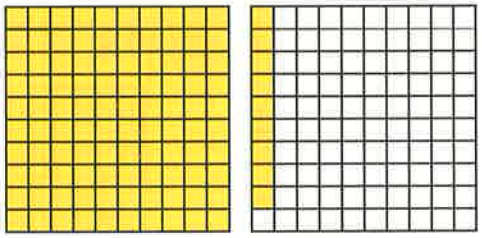
3.



____

—— = ________

4.

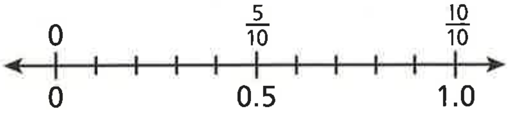


1 and ______________

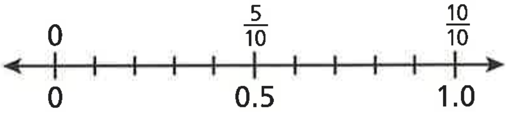
1— = ________

Draw points on the number line diagram to represent the numbers. Label each point as a fraction and decimal.

5. 5 hundredths

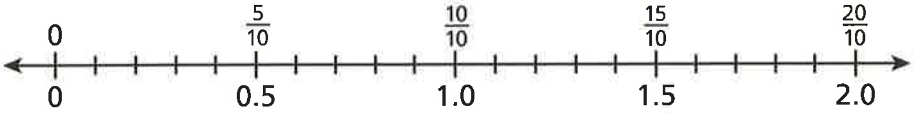

0
$\frac{5}{10}$
$\frac{10}{10}$
0
0.5
1.0

6. 68 hundredths


0
$\frac{5}{10}$
$\frac{10}{10}$
0
0.5
1.0

7. Compare the numbers in exercises 5 and 6 above. Which is the greater decimal? Explain.

8. 8 tenths, 91 hundredths, 1 and 38 hundredths


0
$\frac{5}{10}$
$\frac{10}{10}$
$\frac{15}{10}$
$\frac{20}{10}$
0
0.5
1.0
1.5
2.0

Independent Practice

Write each money amount as a sum of fractions. Then write the expanded decimal form. Use the table at the right to help.

Money Amounts

Coin	Fraction of 1 Dollar
Dime	$\frac{1}{10}$
Penny	$\frac{1}{100}$

9. 5 dimes and 3 pennies

fraction: ______ = ______ + ______

decimal: $0.53 = ______ + ______

10. 13 pennies and 2 dimes

fraction: ______ = ______ + ______

decimal: $0.33 = ______ + ______

11. 1 dollar and 7 pennies

fraction: ______ = ______ + ______

decimal: $1.07 = ______ + ______

12. 4 dollars and 9 dimes

fraction: ______ = ______ + ______

decimal: $4.90 = ______ + ______

All of the fractions are for the same-size whole.
Write the fractions as decimals.
Use <, =, or > to compare.
Use the place-value chart to help.

tens	ones	.	tenths	hundredths
		.		

13. $\frac{1}{10}$ and $\frac{8}{10}$

______ ______

14. $\frac{15}{100}$ and $\frac{7}{100}$

______ ______

15. $\frac{32}{100}$ and $\frac{9}{10}$

______ ______

16. $\frac{6}{10}$ and $\frac{40}{100}$

______ ______

17. $1\frac{18}{100}$ and $1\frac{2}{10}$

______ ______

18. $2\frac{5}{10}$ and $2\frac{50}{100}$

______ ______

Independent Practice

MP1 **19.** Use the patterns in the table to help you write decimals for fractions with a denominator of 100. What decimals are equivalent to $\frac{4}{100}$, $\frac{14}{100}$, and $1\frac{14}{100}$?

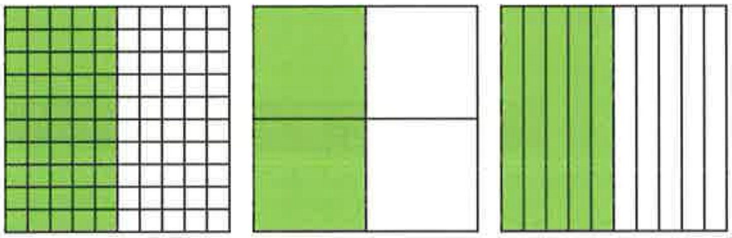
Fraction	Decimal
$\frac{3}{10}$	0.3
$\frac{3}{100}$	0.03
$1\frac{3}{100}$	1.03

Answer ____________________

Justify your answer using words, drawings, or numbers.

MP7 **20.** Annika says that you can use this pattern to write a fraction or mixed number for a decimal: if a decimal has two places to the right of the decimal point, the denominator will be 100, so there will be two zeros in the denominator; if a decimal has one place to the right of the decimal point, the denominator will be 10, so there will be one zero in the denominator. Do you agree? Give examples.

MP3 **21.** Steven says that decimals are easier to compare than fractions. Do you agree? Use the amounts modeled below as an example.



MP6 **22.** Priya needs to measure a length of exactly 0.45 meter for science class. Where does 0.45 belong on a number line?

Show your work.

Answer ____________________

Independent Practice

MP1 **23.** One bottle has 1.25 pints of water. The other bottle has 1.4 pints of water. Which bottle has more water?

Show your work.

Answer ______________________

MP7 **24.** Dennis thinks he may have a fever. In the morning, his temperature is 99.45 degrees. In the afternoon, the school nurse says his temperature is ninety-nine and 6 hundredths. Does Dennis's temperature go up or down by the afternoon?

Show your work.

Answer ______________________

MP2 **25.** Jacob says that 1.5 is not the same as 1.50 because 1 dollar and 5 dimes equal $1.50, not $1.5. Do you agree that 1.5 and 1.50 are not equivalent? You can use hundredths models to help support your answer.

Answer ______________________

Justify your answer using words, drawings, or numbers.

UNIT 3 Common Core Review

Add or subtract.

1. $\frac{1}{5} + \frac{1}{5} =$ ________________ **2.** $\frac{8}{6} - \frac{3}{6} =$ ________________

3. $4\frac{1}{8} + \frac{7}{8} =$ ________________ **4.** $3\frac{1}{4} - 1\frac{3}{4} =$ ________________

Compare. Write <, =, or >.

5. $\frac{3}{4}$ ○ $\frac{9}{12}$ **6.** $\frac{3}{3}$ ○ $\frac{9}{10}$ **7.** $\frac{2}{5}$ ○ $\frac{2}{3}$

Circle the correct answer.

8. Which fraction is equivalent to $\frac{1}{2}$?

a. $\frac{10}{24}$ **b.** $\frac{6}{12}$

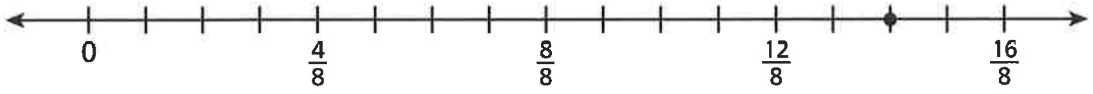
c. $\frac{2}{3}$ **d.** $\frac{3}{4}$

9. Which fraction is equivalent to $\frac{40}{100}$?

a. $\frac{10}{4}$ **b.** $\frac{5}{10}$

c. $\frac{2}{5}$ **d.** $\frac{1}{5}$

10. Jaxon is writing a fraction as a sum of three addends. The fraction is represented by the point on the number line.



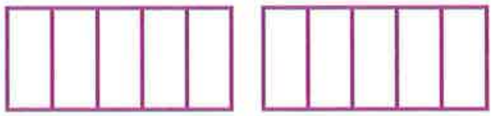
So far, Jaxon has two addends, $\frac{3}{8}$ and $\frac{7}{8}$. Which of the following can Jaxon use as the third addend?

a. $\frac{4}{8}$ **b.** $\frac{6}{8}$

c. $\frac{10}{8}$ **d.** $\frac{14}{8}$

11. Shade the model to show $7 \times \frac{1}{5}$. Then multiply.

$7 \times \frac{1}{5} =$ ________________



UNIT 3 Common Core Review

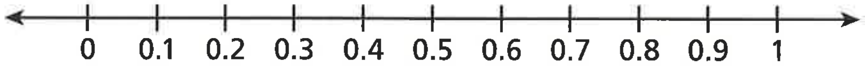
Write an equation to multiply. Write the product as a whole number or mixed number.

12. $2 \times \frac{4}{5}$

13. $9 \times \frac{5}{9}$

14. Draw a model to show that $0.6 > 0.52$.

15. Draw and label the point 0.67 on the number line.



Solve the problems.

16. Peyton surveyed 100 students about their transportation to school. Forty-three hundredths students reported riding bicycles to school and $\frac{3}{10}$ students said they walked. What fraction of the students surveyed rode bicycles or walked to school?

Show your work.

Answer ____________________

17. A pancake recipe calls for $\frac{2}{4}$ cup whole wheat flour, $\frac{2}{4}$ cup white flour, and $\frac{1}{4}$ cup corn flour. How many cups of flour does the recipe call for in all?

Show your work.

Answer ____________________

UNIT 3 Common Core Review

MP8 **18.** Liko used a 10 × 10 grid and Yuri used an 8 × 8 grid to represent the same whole unit. Each boy shaded grid squares to show $\frac{1}{4}$. How many grid squares did Liko shade? How many grid squares did Yuri shade?

Answer ______________________________

Use fraction models. Show why Liko and Yuri had to shade a different number of squares to show $\frac{1}{4}$.

MP3 **19.** Samantha says that $\frac{3}{6} = \frac{2}{3} + \frac{1}{3}$. Describe Samantha's error and tell how to correct it.

Justify your answer using words, drawings, or numbers.

MP2 **20.** For a class party Ms. Vega estimates each student will eat $\frac{1}{6}$ pizza. There are 22 students. How many pizzas should Ms. Vega order? How much pizza will be left over?

Answer ______________________________

Justify your answer using words, drawings, or numbers.

Performance Task 1

4.OA.1, 4.OA.2, 4.OA.3, 4.NBT.1, 4.NBT.2, 4.NF.3a, 4.NF.3d, 4.NF.4a, 4.NF.4c, 4.NF.6, 4.NF.7

Performance Tasks

Performance Tasks show your understanding of the Math that you have learned. You will be doing various Performance Tasks as you complete your work in this text.

Beginning This Task

The next five pages provide you with the beginning of a Performance Task. You will be given 5 items to complete, and each item will have two or more parts. As you complete these items you will:

- **I** Demonstrate that you have mastered mathematical skills and concepts
- **II** Reason through a problem to a solution, and explain your reasoning
- **III** Use models and apply them to real-world situations.

Extending This Task

Your teacher may extend this Performance Task with additional items provided in our online resources at sadlierconnect.com.

Scoring This Task

Your response to each item will be assessed against a rubric, or scoring guide. Some items will be worth 1 or 2 points, and others will be worth more. In each item you will show your work or explain your reasoning.

Performance Task 1

A Visit to the Natural History Museum

1. The fourth-grade students go on a field trip to the Natural History Museum. They vote to decide where they will start their visit in the museum.

a. Seven children vote to start at the Whale Exhibit. Three times as many children vote to start at the Minerals Hall. Draw a diagram to show the comparison.

Whale Exhibit

Minerals Hall

b. Explain how your diagram shows the comparison.

c. Write an equation to show the comparison.

w = number of votes for the Whale Exhibit

m = number of votes for the Minerals Hall

d. Use your equation and the information given in the problem to find the number of students who vote to start at the Minerals Hall.

Deep-Sea Minerals

2. A scientist will talk about deep-sea minerals. Many students will listen to the scientists. Fifty-four students are already seated. The remaining 32 students are standing in line. The seats are arranged in rows. Each row has 9 seats.

a. Describe the steps you will take to find how many rows of seats are needed for all the students.

b. Write an equation that shows how you can find the number of rows of seats the students will need. Use r to represent the unknown number of rows.

c. Find the number of rows the students will need. Explain how you decided on the final answer.

d. Check that your answer is reasonable. Use reasoning or mental math. Justify your reasoning.

Performance Task 1

Ocean Giants

3. At the Whale Exhibit, the class sees whale fossils, whale skeletons, and whale models. The table shows the masses of different species of whales.

Whales	
Species	**Mass (kg)**
Orca	five thousand, seven hundred sixty-four
Blue	100,000 + 60,000 + 3000 + 70 + 2
Humpback	30,000 + 4000 + 200 + 90
Gray	thirty-three thousand, three hundred eight
Beluga	6000 + 100 + 70 + 8

a. Write the mass of each whale in standard form.

b. Which whale has the greatest mass? Which whale has the least mass?

c. Explain how you found the whale with the greatest mass and the whale with the least mass.

d. Write the names of the whales in order from least mass to greatest mass.

Performance Task 1

Dinosaur Tracks

4. A museum guide shows the fourth-grade class a model of dinosaur tracks found in Utah. Each step is $\frac{1}{3}$ meter long. The dinosaur took 7 steps.

a. Draw a model to show the total length of the 7 steps.

b. Write an addition equation that represents the length of the 7 steps. Use *m* to represent the total length.

c. Write a multiplication expression that represents the length of the 7 steps. Use *m* to represent the total length.

d. Find the total length of the 7 steps. Explain your method and why you chose that method.

Performance Task 1

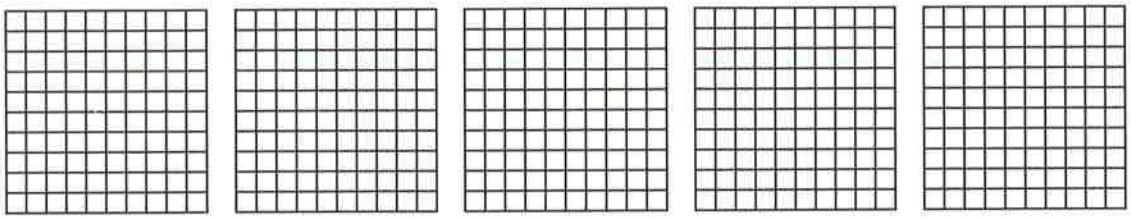
Fossil Footprints

5. The children see a display of five fossil dinosaur footprints. The data below shows the lengths of the footprints in meters.

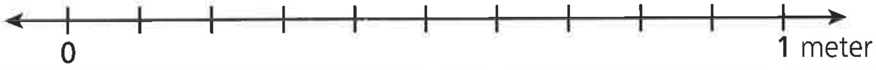
Footprint Lengths (meter)

$\frac{2}{10}$	0.15	$\frac{6}{100}$	$\frac{42}{100}$	0.1

a. Each large square represents 1 whole. Color the models to show each fraction and decimal from the data.



b. Label points on the number line to show each fraction and decimal from the data.



c. Order the lengths of the footprints from least to greatest. Explain the method you used and why you chose that method.

Progress Check

UNIT 4

Look at how the Common Core standards you have learned and will learn connect.

It is very important for you to understand the standards from the prior grade level so that you will be able to develop an understanding of measurement and data in this unit and be prepared for next year. To practice your skills, go to sadlierconnect.com.

GRADE 3		GRADE 4		GRADE 5
I Can...	Before Unit 4	**Can I ?**	After Unit 4	**I Will...**
	☐	**4.MD.1** Express measurements in a larger unit in terms of a smaller unit within the same system	☐	**5.MD.1** Convert among different-sized measurement units within the same measurement system while solving problems
3.MD.2 Measure and estimate liquid volumes and masses Solve one-step problems involving masses or volumes	☐	**4.MD.2** Solve word problems involving distance, time, liquid volumes, masses, and money	☐	
3.MD.7 Find the area of a rectangle **3.MD.8** Solve real-world and mathematical problems involving perimeter	☐	**4.MD.3** Solve real-world and mathematical problems using the area and perimeter formulas for rectangles	☐	**5.MD.5** Apply the volume formulas for rectangular prisms in real-world and mathematical problems
3.MD.4 Display a set of measurements in inches, half inches, and quarter inches on a line plot	☐	**4.MD.4** Make a line plot and use the data to solve problems	☐	**5.MD.2** Make a line plot and use the data to solve problems
	☐	**4.MD.5** Understand angles and angle measurement	☐	
	☐	**4.MD.6** Measure angles using a protractor or sketch angles with a given number of degrees	☐	
	☐	**4.MD.7** Solve problems by using addition and subtraction to find unknown angle measures	☐	

HOME ✦ CONNECT...

The customary system of measurement is most commonly used in the United States of America. In other parts of the world, the metric system of measurement, which is based on 10, is more common. Units of measurement can be converted as equivalent measurements in smaller or larger units.

The meter is a basic metric unit of length. The table below shows the relationship between the sizes of units shorter than and greater than 1 meter.

Metric Unit of Length	Equivalent Lengths	
kilometer	1000 meters	10 hectometers
meter	1 meter	10 decimeters
centimeter	$\frac{1}{100}$ meter	10 millimeters
millimeter	$\frac{1}{1000}$ meter	

Conversation Starter: Make a game of naming units of metric or customary measurement that would most likely be used when measuring distances, liquid volumes, or weights. For example:

- The length of a caterpillar
- The weight of a dog
- The volume of a water bottle
- The volume of a swimming pool

In this unit your child will:

- Convert customary and metric measurement units.
- Solve problems involving measurement, area and perimeter formulas, and line plots.
- Use a protractor to measure angles.
- Find unknown angle measures.

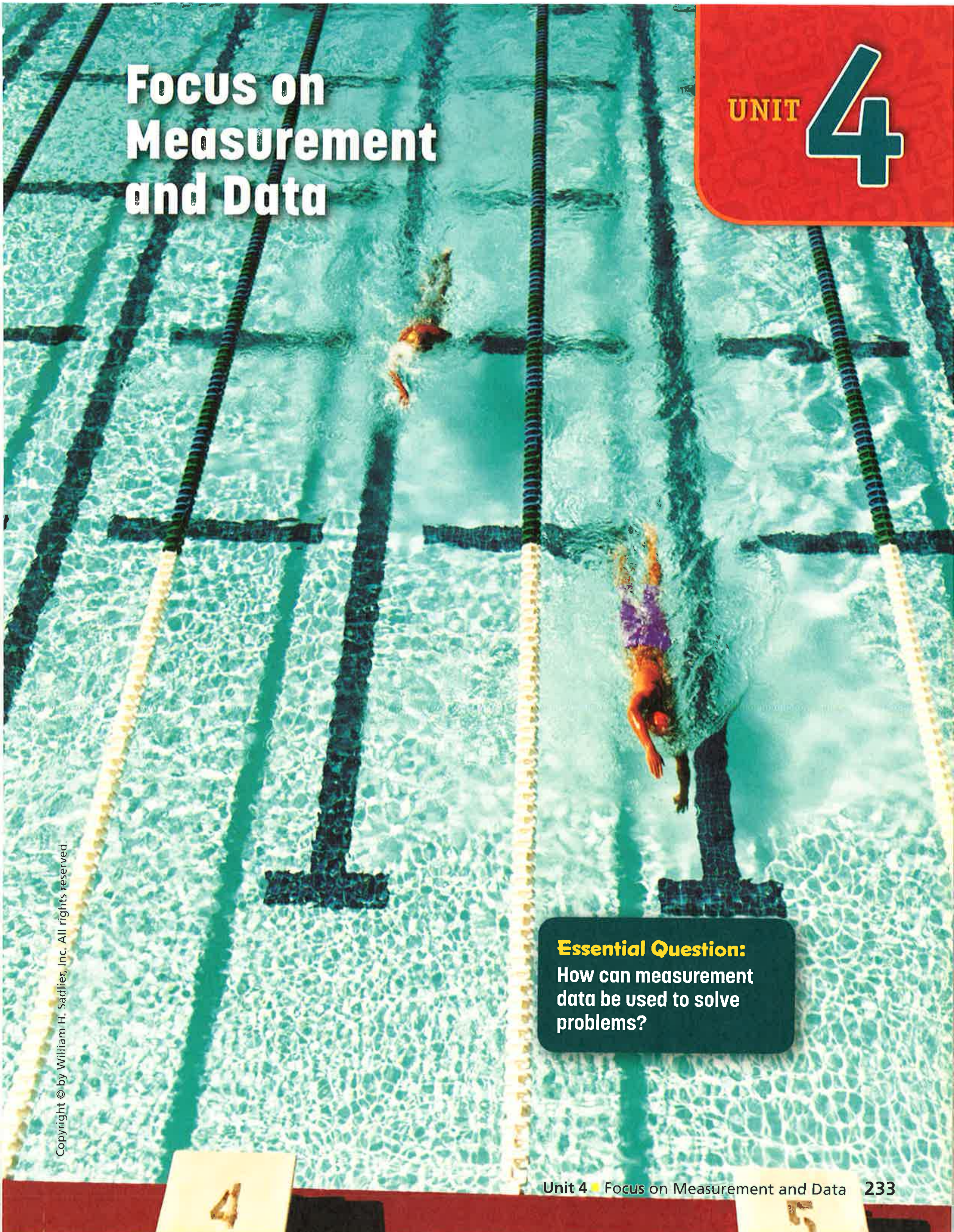
NOTE: All of these learning goals for your child are based on the Grade 4 Common Core State Standards for Mathematics.

Ways to Help Your Child

Writing neatly and showing math work clearly is important. Your child's teacher will analyze math homework to better understand your child's progress and thought processes. During homework time, encourage neat drawing and writing.

ONLINE

For more Home Connect activities, continue online at sadlierconnect.com



UNIT 4

Focus on Measurement and Data

Essential Question:
How can measurement data be used to solve problems?

Lesson

26 Convert Customary Measurement Units

Essential Question:
How are larger and smaller customary units of measurement related?
4.MD.1

Words to Know:
customary units

Guided Instruction

In this lesson you will learn about customary units of measurement and how to convert measurements expressed in larger units as measurements in equivalent smaller units.

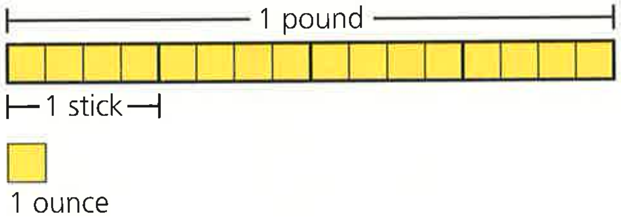
Understand: Relative sizes of customary units of weight

A restaurant serves 1 ounce of butter with each basket of bread. Will 4 pounds of butter be enough for 50 baskets of bread?

Customary units are the measurement units used in the United States customary system of measurement. A pound and an ounce are customary units of weight. 1 pound is heavier than 1 ounce, so 1 pound is a larger unit.

The model shows the relationship between 1 pound and 1 ounce of butter. The long bar represents 1 pound and the short bar represents 1 ounce.

Customary Units of Weight
1 pound (lb) = 16 ounces (oz)



Complete this conversion table to express pounds as ounces.

Pounds	Ounces	
1	16	
2	32	← 2 × 16
3	48	← 3 × 16
4	64	← 4 × 16

Four pounds of butter is equivalent to 64 ounces. 64 > 50

➡ Four pounds of butter will be enough for 50 bread baskets.

Guided Instruction

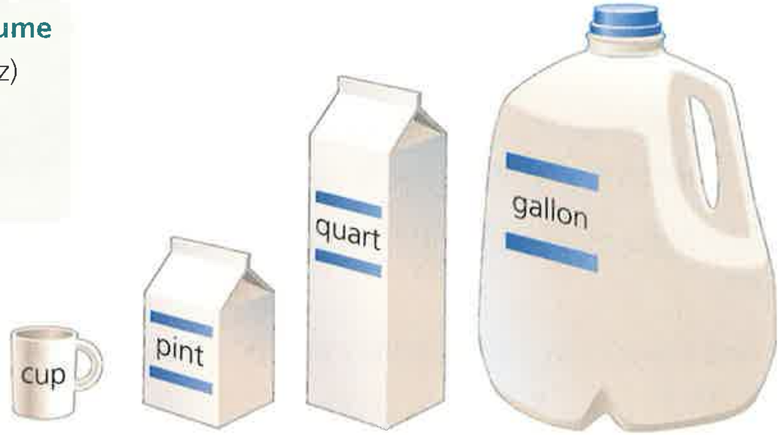
Understand: Relative sizes of customary units of liquid volume

Lisa's mother goes to the corner store to buy 3 gallons of milk. When she gets there, she sees that there are only quart containers of milk left. How many quarts of milk should she buy?

A gallon, a quart, a pint, and a cup are customary units of liquid volume. The picture shows how the units are related.

Customary Units of Liquid Volume

1 cup (c) = 8 fluid ounces (fl oz)
1 pint (pt) = 2 cups
1 quart (qt) = 2 pints
1 gallon (gal) = 4 quarts



Use the information above to complete the conversion table.

Gallons	Quarts	
1	4	
2	8	← 2 × 4
3	12	← 3 × 4

Three gallons of milk is the same amount as 12 quarts.

➨ Lisa's mother should buy 12 quarts of milk.

How many cups of milk can Lisa's mother pour from 3 gallons of milk? Explain.

Guided Instruction

Connect: Relating units and converting time measurements

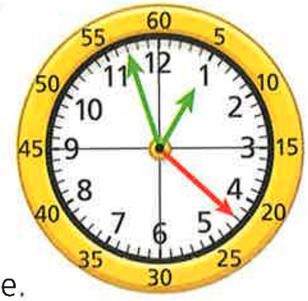
Kevin is helping his mother fold and put letters in envelopes. If it takes him 9 seconds for each envelope, how many envelopes can Kevin complete in 3 minutes?

An hour, a minute, and a second are units of time.

Units of Time

1 minute (min) = 60 seconds (s)

1 hour (h) = 60 minutes



The clock shows that there are 60 minutes in 1 hour. There are also 60 seconds in each minute.

The minute hand moves around the clock one complete turn (60 minutes) each hour.

The second hand moves around the clock one complete turn (60 seconds) each minute.

To solve the problem, first find how many seconds are in 3 minutes. Then find how many groups of 9 seconds are on that number of seconds.

Step 1

Complete the conversion table to find the number of seconds in 3 minutes.

Minutes	Seconds	
1	60	
2	120	← 2 × 60
3	180	← 3 × 60

Step 2

Find the number of envelopes Kevin can complete in 180 seconds.

To find how many groups of 9 seconds there are in 180 seconds, divide 180 by 9.
$180 \div 9 = 20$

➡ Kevin can complete 20 envelopes in 3 minutes.

How many seconds are there in 1 hour? Explain.

Guided Practice

Customary Units of Measurement	
Length	**Weight**
1 foot = 12 inches 1 yard = 3 feet	1 pound = 16 ounces 1 ton = 2,000 pounds
Liquid Volume	**Time**
1 cup = 8 fluid ounces 1 pint = 2 cups 1 quart = 2 pints 1 gallon = 4 quarts	1 minute = 60 seconds 1 hour = 60 minutes 1 day = 24 hours 1 week = 7 days

Complete the sentence to compare the sizes of the units.

1. The smallest customary unit of time is 1 ____________.

2. 1 yard is ____________ times as long as 1 foot.

3. 1 quart is 2 times as much as 1 ____________.

4. 1 ton is ____________ times as heavy as 1 ____________.

5. 1 quart is 4 times as much as 1 ____________.

6. 1 yard is ____________ times as long as 1 inch.

Complete the conversion tables. Then use the pattern to complete the equations below.

7.

Cups	Fluid Ounces
1	8
2	
3	

4 cups = ____ ounces

8.

Pounds	Ounces
1	
2	
3	

6 pounds = ____ ounces

Think • Pair • Share

MP7 **9.** What equation can you use to convert 3 pounds to ounces directly, without a conversion table?

Independent Practice

Customary Units of Measurement	
Length	**Weight**
1 foot = 12 inches 1 yard = 3 feet	1 pound = 16 ounces 1 ton = 2,000 pounds
Liquid Volume	**Time**
1 cup = 8 fluid ounces 1 pint = 2 cups 1 quart = 2 pints 1 gallon = 4 quarts	1 minute = 60 seconds 1 hour = 60 minutes 1 day = 24 hours 1 week = 7 days

Write < or > to compare the sizes of the units. Then write a comparison using multiplication.

1. foot ____ inch

1 foot is ______________________

______________________.

2. second ____ minute

1 minute is ______________________

______________________.

3. fluid ounce ____ cup

1 cup is ______________________

______________________.

4. pint ____ fluid ounce

1 pint is ______________________

______________________.

Complete the conversion tables. Then use the pattern to complete the equations below.

5.

Feet	Inches
1	12
2	
3	
4	

5 feet = ____ inches

6.

Pints	Cups
1	
2	
3	
4	

10 pints = ____ cups

Write the equivalent measurement.

7. 5 yards = ________ feet

8. 3 pounds = ________ ounces

9. 6 quarts = ________ pints

10. 1 day = ________ minutes

Independent Practice

Convert the measurements. You can use the Customary Units of Measurement chart on page 238.

11. 3 yards = ____ feet

12. 2 pounds = ____ ounces

13. 4 gallons = ____ quarts

14. 4 days = ____ hours

15. 2 yards = ____ inches

16. 5 quarts = ____ cups

For exercises 17–22, circle the correct answer.

17. Claudia uses eye drops to help with her contact lenses. The bottle of eye drops is about the size of a thumb. Which unit is probably printed on the bottle?

    a. pint
    b. fluid ounces
    c. quart
    d. cup

18. Jerry is mailing 4 boxes of books. Which unit should Jerry use to measure the total weight of the 4 boxes?

    a. ounces
    b. pounds
    c. tons
    d. quarts

19. Each student has 5 minutes to explain his or her project to the class. How many seconds does each student have?

    a. 50 seconds
    b. 60 seconds
    c. 300 seconds
    d. 360 seconds

20. A restaurant offers a large order of chicken soup. If the large order is 3 pints of soup, how many fluid ounces (fl oz) do you get?

    a. 6 fl oz
    b. 8 fl oz
    c. 12 fl oz
    d. 48 fl oz

21. The tallest living man in the world is 8 feet and 3 inches tall. What is his height in inches?

    a. 27 inches
    b. 96 inches
    c. 99 inches
    d. 128 inches

22. One mile is 5,280 feet. How many yards equal 1 mile?

    a. 440 yards
    b. 1,760 yards
    c. 15,840 yards
    d. 63,360 yards

Independent Practice

MP6 **23.** Michael says that if you convert a whole number of feet to inches, the number of inches must be a multiple of 12. Is Michael correct?

MP7 **24.** Charlotte's baby brother weighs 9 pounds 12 ounces when he is born. Charlotte says that this weight is already in the smallest units possible, because it includes ounces. Is Charlotte correct, or can you convert the weight to smaller units?

Solve the problems.

MP5 **25.** A clothing designer needs 4 yards of fabric to make a sample outfit. If the designer has 16 feet of the fabric, is there enough fabric to make one outfit?

Show your work.

Answer ______________________________

MP6 **26.** Tammy drinks 2 pints of milk every day. Her doctor says that girls her age should drink 3 cups of milk every day to be healthy. How many extra cups of milk does Tammy drink in 1 week?

Show your work.

Answer ______________________________

Independent Practice

MP1 **27.** Steve wants to paint his room light blue. He picks up 3 gallons of white paint at the store. He also buys 2 quarts of blue to mix with the white paint. How many quarts of paint does Steve buy altogether?

Show your work.

Answer ____________________

MP3 **28.** Molly says that to convert 100 fluid ounces to cups, you can divide 100 by 8. Then any remainder will be a whole number of fluid ounces. Is Molly correct?

Answer ____________________

Justify your answer using words, drawings, or numbers.

MP8 **29.** William makes the table below to convert fractions of an hour to minutes.

Hour	Minutes
$\frac{1}{4}$	25
$\frac{1}{2}$	50
$\frac{3}{4}$	75
1	100

Did William convert the measurements correctly?

Answer ____________________

Justify your answer using words, drawings, or numbers.

Lesson

27 Convert Metric Measurement Units

Essential Question:
How are larger and smaller metric units of measurement related?
4.MD.1

Words to Know:
metric units

Guided Instruction

In this lesson you will learn about metric units of measurement and how to convert measurements expressed in larger units as equivalent measurements in smaller units.

Understand: Relative sizes of metric measurements of length

What are the metric units of length and which units are used most often?

Metric units are the measurement units used in the metric system of measurement.
A meter is the basic unit of length in the metric system.

The chart shows how each metric unit of length compares to 1 meter. The units used most often are kilometer, meter, centimeter, and millimeter. These units are highlighted in the chart.

Like the base-ten number system, the metric system is also based on 10. Each unit is 10 times the length of the next smaller unit.

Metric Unit of Length	Equivalent Lengths	
kilometer	**10 hectometers**	**1000 meters**
hectometer	10 dekameters	100 meters
dekameter	10 meters	10 meters
meter	**10 decimeters**	**1 meter**
decimeter	10 centimeters	$\frac{1}{10}$ meter
centimeter	**10 millimeters**	**$\frac{1}{100}$ meter**
millimeter		**$\frac{1}{1000}$ meter**

Remember!
Each place value in whole and decimal numbers is 10 times the next place to the right.

The chart above shows the metric units of length. The highlighted rows show the units used most often.

- Which units in the chart are longer than 1 meter? Which units are shorter than 1 meter? What is the longest unit in the chart? What is the shortest unit?

Guided Instruction

Understand: Converting metric units of length

Lucy is running a 5K race. A 5K race is 5 kilometers long. She stops for a few seconds at the halfway point. How many meters does Lucy have left to run?

The chart shows how the most often used metric units of length are related.

Metric Units of Length

1 kilometer (km) = 1000 meters (m)
1 meter = 100 cm (cm)
1 centimeter = 10 millimeters (mm)

- **1 kilometer** is about the distance you walk if you walk around a football field 3 times.
- **1 meter** is about the distance from a door knob to the floor.
- **1 centimeter** is about the width of your finger.
- **1 millimeter** is about the thickness of a dime.

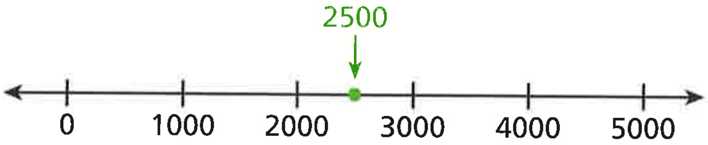
To solve the problem, find the number of meters in a 5K race.

The chart shows that 1 kilometer = 1000 meters.
Complete this conversion table.

Kilometers	Meters	
1	1000	
2	2000	← 2 × 1000
3	3000	← 3 × 1000
4	4000	← 4 × 1000
5	5000	← 5 × 1000

The race is 5000 meters long.

2500 is exactly between 0 and 5000 on the number line.



The halfway point is at 2500 meters. Lucy has run 2500 meters and has 2500 meters left to run.

Lucy has 2500 meters left to run.

Which is longer: a kilometer or a meter? A millimeter or a meter? Explain.

Lesson 27 Convert Metric Measurement Units

Guided Instruction

Connect: Converting metric units of liquid volume and mass

Andrew buys 6 bottles of orange juice. Each has 355 milliliters of juice. Does Andrew buy more or less than 2 liters of juice?

The chart shows how the metric units of liquid volume are related.

Metric Units of Liquid Volume

1 liter (L) = 1000 milliliters (mL)

- **1 liter** is about the amount of 8 small juice boxes.
- **1 milliliter** is about 20 drops.

To solve the problem, first find the number of milliliters in 2 liters.

Liters	Milliliters
1	1000
2	2000

← 2 × 1000   2 liters of juice is equivalent to 2000 milliliters.

Compare 2000 milliliters to the number of milliliters in the 6 bottles of juice.

6 × 355 = 2130   The 6 bottles have ______ milliliters.   2130 > 2000

➡ Andrew buys more than 2 liters of juice.

A nickel has a mass of 5 grams. How many nickels are in a pile of nickels that has a mass of 3 kilograms?

Metric Units of Mass

1 kilogram (kg) = 1000 grams (g)

- **1 kilogram** is about the mass of 10 apples.
- **1 gram** is about the mass of 1 paperclip.

To solve the problem, first find the number of grams in 3 kilograms.

Kilograms	Grams
1	1000
2	2000
3	3000

← 2 × 1000

← 3 × 1000   3 kg is equivalent to 3000 g.

Find the number of groups of 5 in 3000 grams. 3000 ÷ 5 = ______

➡ There are 600 nickels in the pile.

Guided Practice

Metric Units of Measurement

Length	Liquid Volume
1 kilometer = 1000 meters 1 meter = 100 cm 1 centimeter = 10 millimeters	1 liter = 1000 milliliters
	Mass
	1 kilogram = 1000 grams

Complete the sentences to compare the sizes of the units.

1. A _______________ is 1000 times as heavy as a gram.

2. There are 1000 _______________ in 1 liter.

3. A _______________ is 10 times as long as 1 millimeter.

4. A meter is _______________ times as long as 1 centimeter.

5. A meter is _______________ times as long as 1 millimeter.

Complete the conversion tables. Then use the pattern to complete the equations below.

6.

Liters	Milliliters
1	1000
2	
3	
4	

5 liters = __________ milliliters

7.

Kilograms	Grams
1	
2	
3	

6 kilograms = __________ grams

Think • Pair • Share

MP2 **8.** Discuss these metric units—meter, gram, and liter. Which of these units has a very small size? Can you think of a reason why this unit is the one that is sometimes used as the basic unit?

Independent Practice

Metric Units of Measurement		
Length	Liquid Volume	Mass
1 kilometer = 1000 meters 1 meter = 100 cm 1 centimeter = 10 millimeters	1 liter = 1000 milliliters	1 kilogram = 1000 grams

Draw lines to match each metric unit with what it measures.

1. meter
   gram
   liter

a. mass
b. length or distance
c. liquid volume

Write an example of something that could be measured with each metric unit.

2. meter ____________

3. gram ____________

4. liter ____________

Write < or > to compare the sizes of the units. Then write a comparison using multiplication.

5. meter ____ centimeter

   1 meter is ____________ as long as 1 centimeter.

6. milliliter ____ liter

   1 liter is

   ______________________________.

7. meter ____ kilometer

   1 kilometer is

   ______________________________.

8. gram ____ kilogram

   1 kilogram is

   ______________________________.

Complete the conversion tables. Then use the pattern to complete the equations below.

9.

Meters	Centimeters
1	
2	
3	
4	

5 meters = ______ centimeters

10.

Liters	Milliliters
1	
2	
3	
4	

8 liters = ______ milliliters

Independent Practice

Convert the measurements. You can use the Metric Units of Measurement chart on page 246.

11. 4 centimeters = ______ millimeters

12. 6 kilometers = ______ meters

13. 5 meters = ______ centimeters

14. 2 kilograms = ______ grams

15. 8 grams = ______ milligrams

16. 3 meters = ______ millimeters

For exercises 17–20, circle the correct answer.

17. Several rolls of yarn are needed to knit a pair of mittens. Which unit is best used to measure lengths of yarn?

a. meter
b. kilometer
c. milliliter
d. liter

18. Which of these units is most likely to be used to measure the mass of a comic book?

a. kilograms
b. grams
c. centimeters
d. liters

19. Josh uses a dropper to give medicine to his cat. Which is the best estimate for the total amount of medicine Josh gives his cat?

a. 2 milliliters
b. 2 millimeters
c. 2 liters
d. 2 meters

20. Amy jogs every day. Which of the following might be the distance she jogs each day?

a. 6 millimeters
b. 6 kilograms
c. 6 kilometers
d. 6 liters

Independent Practice

MP5 **21.** In science class, the students are growing beans and measuring the roots. A meter stick is 1 meter long, and a metric ruler is about 30 centimeters long. Which tool is better for measuring the bean roots? Explain.

MP7 **22.** Allison says that 5 centimeters can also be written as 50 millimeters. Dave says that 50 millimeters is incorrect, since 50 millimeters can be written as a whole number of centimeters. Who do you agree with? Explain.

Solve the problems.

MP1 **23.** A school textbook has a mass of about 1 kilogram. Joel is taking 3 textbooks home from school. In grams, what is the combined mass of the books that Joel is taking?

Show your work.

Answer ____________________________

MP6 **24.** One milliliter of water has a mass of 1 gram. Trisha buys 5 liters of water. What is the mass of the water in kilograms?

Show your work.

Answer ____________________________

Independent Practice

MP3 **25.** Toni has a bottle of grape juice that is labeled 1893 milliliters. Oliver has a bottle of grape juice that is labeled 2 liters. Toni says that her bottle has more grape juice than Oliver's. Is Toni correct?

Show your work.

Answer ____________________

MP7 **26.** The produce section of a grocery store has a digital scale that customers can use. The scale shows that a bunch of bananas has a mass of 1.2 kilograms. If the bunch has 6 bananas that are about the same size, what could be the mass in grams of 1 banana?

Answer ____________________

Justify your answer using words, drawings, or numbers.

MP8 **27.** A very small unit of mass is the milligram (mg). One gram is equivalent to 1000 milligrams. Raul learns that he should have at least 1 gram of calcium each day. A glass of milk has about 300 milligrams of calcium. If Raul drinks 4 glasses of milk, will that give him enough calcium for the day?

Answer ____________________

Justify your answer using words, pictures, or numbers.

Lesson

28 Problem Solving: Measurement

Essential Question:
How can you use what you know about whole numbers, fractions, and decimals to solve measurement problems?
4.MD.2

Guided Instruction

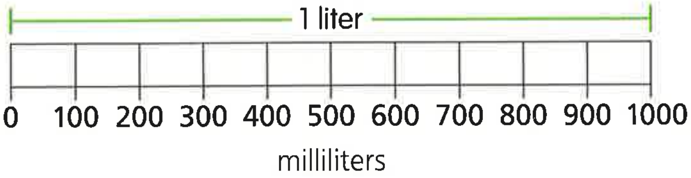
In this lesson you will learn how to use diagrams and what you know about measurement to solve real-world problems.

Understand: Using a diagram with a measurement scale to solve a problem

Mrs. Norton buys 30 liters of fruit punch for the fourth grade end-of-year party. Does she buy enough punch so that each of the 114 students can have 250 milliliters of punch?

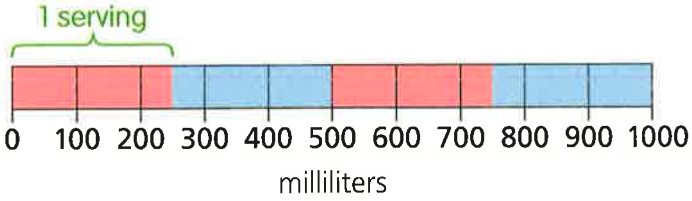
To find out if Mrs. Norton buys enough punch, find the number of 250-ml servings in 30 liters and compare that number to the number of students.

Draw a diagram to show 1 liter as milliliters.



Remember!
1 liter = 1000 milliliters

Color the diagram to find the number of servings in 1000 milliliters. Each serving is 250 milliliters.



There are 4 servings in 1000 milliliters, or 1 liter.

So, there are 30 × 4, or 120 servings in 30 liters.

$120 > 114$

Yes, Mrs. Norton buys enough punch.

How could you use a calculator to solve the problem in a different way?

Guided Instruction

Understand: Using models for units of time

Cindy goes to see a movie. The movie starts at 2:30 P.M. and ends 2 hours and 45 minutes later. What time does the movie end?

To solve the problem, you can use a number line to model the time and the number of hours and minutes.

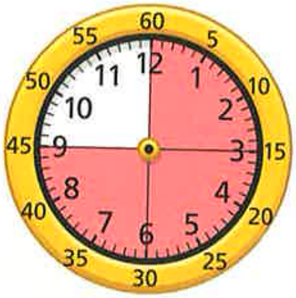
The clock at the right shows:

1 hour = 60 minutes

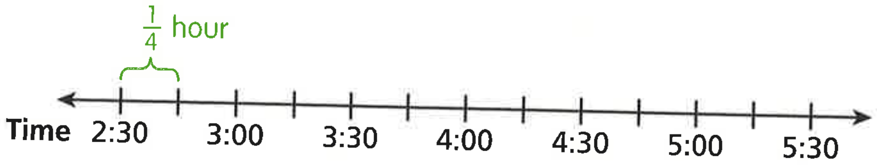
$\frac{1}{4}$ hour = 15 minutes

$\frac{1}{2}$ hour = 30 minutes

$\frac{3}{4}$ hour = 45 minutes

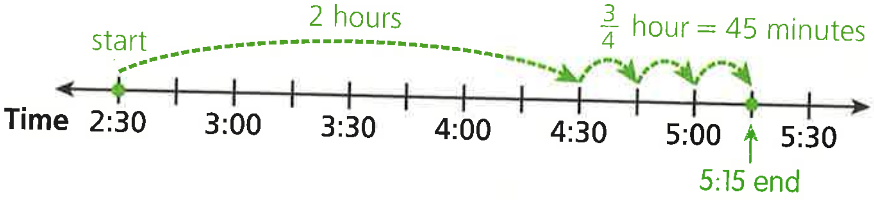

60
5
10
15
20
25
30
35
40
45
50
55
12
1
2
3
4
5
6
7
8
9
10
11

The number line shows the time in quarter hours starting at 2:30 P.M.


$\frac{1}{4}$ hour
Time
2:30
3:00
3:30
4:00
4:30
5:00
5:30

Remember!
A quarter hour is $\frac{1}{4}$ hour or 15 minutes.

Use the number line to count 2 hours 45 minutes ahead. Move 2 hours to the right. Then add $\frac{3}{4}$ hour.


start
2 hours
$\frac{3}{4}$ hour = 45 minutes
Time
2:30
3:00
3:30
4:00
4:30
5:00
5:30
5:15 end

➡ The movie ends at 5:15 P.M.

Cindy's mother picks her up $\frac{1}{2}$ hour after the movie ends. What time does Cindy's mother pick her up? Explain.

Guided Instruction

Connect: Modeling and converting customary units

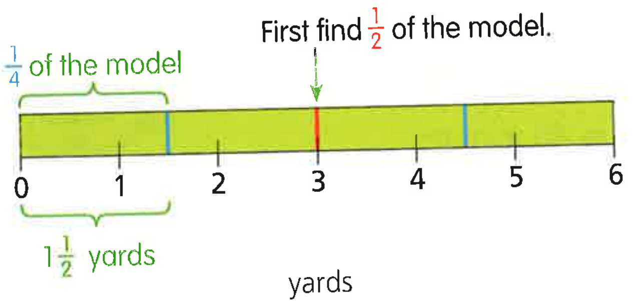
Zach is helping his parents plan their vegetable garden. The garden is 6 yards wide. Zach's family wants 4 sections of equal width to plant 4 different kinds of vegetables. How many feet wide should Zach's family make each section?

To solve the problem, you can work with yards and then convert your answer to feet.

Step 1

The model shows the width of the garden as 6 yards. Partition the model into 4 equal sections. First, mark half the area. Then split each half in half to make 4 equal sections, or fourths.

Each section will be $1\frac{1}{2}$ yards wide.


First find $\frac{1}{2}$ of the model.
$\frac{1}{4}$ of the model
0
1
2
3
4
5
6
$1\frac{1}{2}$ yards
yards

Step 2

Now convert $1\frac{1}{2}$ yards to feet.

$$1 \text{ yard} = 3 \text{ feet}$$

$$\frac{1}{2} \text{ yard} = 1\frac{1}{2} \text{ feet}$$

$$\text{So, } 1\frac{1}{2} \text{ yards} = 3 \text{ feet} + 1\frac{1}{2} \text{ feet}$$

$$= 4\frac{1}{2} \text{ feet}$$

Zach's family should make each section $4\frac{1}{2}$ feet wide.

Explain how you could use the model in Step 1 to explain that $\frac{1}{2}$ yard is $1\frac{1}{2}$ feet.

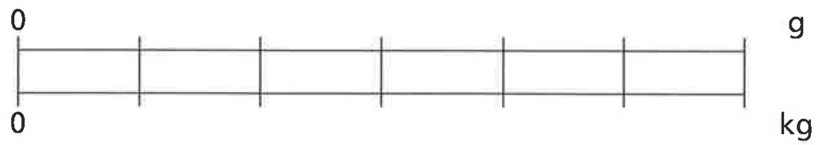
Guided Practice

Read the problem and answer the questions. Use the model to help you solve. Show your work.

1. Vicky buys 6 kilograms of potatoes. Each potato is about the same size and has a mass of 500 grams. How many potatoes does Vicky buy?

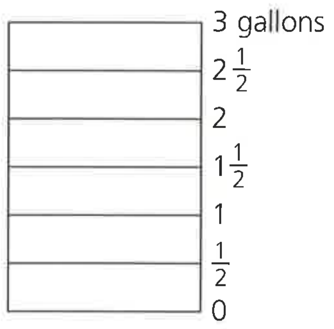
a. What do you need to find?

b. What units will you use?



Answer

2. The directions on a bottle of plant food say to mix $\frac{2}{3}$ cup of plant food with 1 gallon of water. If there are $2\frac{1}{2}$ gallons of water in a watering can, how much plant food should you use?



a. What do you need to find?

b. What units will you use?

Answer

Think • Pair • Share

MP2 **3.** Why is it important to pay attention to the units of measurement in a word problem? Use the problems above to explain your answer.

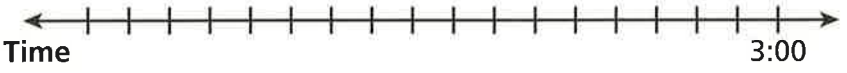
Independent Practice

Read the problem and answer the questions. Use the model to help you solve. Show your work.

1. The third showing of a movie starts at 3 P.M. The movie is $1\frac{1}{2}$ hours long. The theater workers spend 15 minutes cleaning the theater in between showings. At what time is the first showing of the movie?

   a. What do you need to find?

   b. What units will you use?

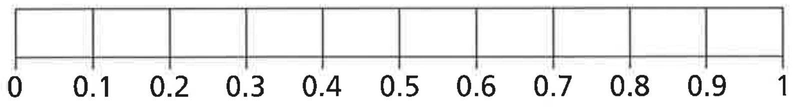


Answer ______________________________

2. Three friends rent a car and take turns driving. Julia drives 75 kilometers, Imani drives 68 kilometers, and Kate drives 47 kilometers. They only used the car radio for 0.1 of the ride. How many meters did they travel with the radio on?

   a. What do you need to find?

   b. What units will you use?



Answer ______________________________

Independent Practice

For exercises 3–5, circle the correct answer. You may use a model to help.

3. Marisa is decorating a room with streamers for a party. She uses 15 feet of red streamers and three times that length of blue streamers. How many yards of streamers does Marisa use altogether?

a. 15 yards
b. 20 yards
c. 45 yards
d. 60 yards

4. A worker at the grocery story cuts a 2-kilogram melon into 5 equal-sized pieces. What is the mass of each piece?

a. 40 grams
b. 400 grams
c. 40 kilograms
d. 400 kilograms

MP1 **5.** A DVD of a cartoon show has five 25-minute cartoons and one special cartoon that is longer. If the total length of the DVD is 3 hours, how long is the special cartoon?

a. 55 minutes
b. 65 minutes
c. 80 minutes
d. 125 minutes

MP5 **6.** Sunita and three friends share some frozen yogurt with extra topping. The yogurt costs $6.25 and the topping costs $3.75. If they split the cost equally, how much will each person pay?

Show your work.

Answer ______________________________

Independent Practice

For problems 7 and 8, use the chart at the right.

Customary Units of Liquid Volume

1 cup (c) = 8 fluid ounces
1 pint (pt) = 2 cups
1 quart (qt) = 2 pints
1 gallon (gal) = 4 quarts

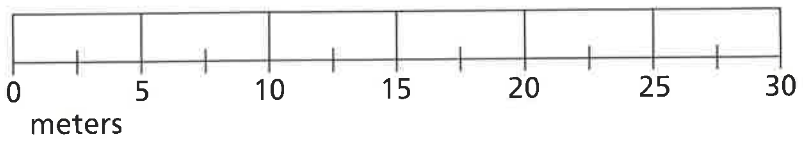
MP7 **7.** Billy's school serves half-pint cartons of milk. Billy wants the school to let students pour their own milk from half-gallon containers. He says that this way, the school will recycle $\frac{1}{8}$ the number of milk cartons that it recycles now. Is Billy correct? Explain.

MP6 **8.** Mandy says that it is more difficult to convert customary units of weight than it is to convert metric units of mass. Do you agree? Why might Mandy think this is true? Explain.

Solve the problems.

MP4 **9.** James takes swimming lessons at a large pool that is divided into lanes. Today, $\frac{1}{5}$ of the lanes are saved for slower swimmers to use. The combined width of the saved lanes is 5 meters. How wide is the whole pool? You can use the model below.

Show your work.



Answer ____

Independent Practice

Solve the problems.

MP6 **10.** Curtis is shopping for a new fish tank. One is labeled as having a volume of 21 liters. He also likes two smaller tanks that have 9500 milliliter and 11,900 milliliter volumes. Which has a greater volume, the 21-liter tank or the two smaller tanks combined?

Show your work.

Answer ________________________________

MP6 **11.** A baker is making loaves of cinnamon bread. He has 2 kilograms of flour. His recipe uses 385 grams of flour for each loaf. Does he have more or less flour than he needs to make 4 loaves? Tell how much more flour he needs or how much more he has than he needs.

Show your work.

Answer ________________________________

MP1 **12.** Felix mixes cashews and pecans together to make a nut mixture. The weight of the pecans is three times the weight of the cashews. The mixture weighs 1 pound altogether. How many ounces do the cashews weigh?

Answer ________________________________

Justify your answer using words, drawings, or numbers.

Lesson

29 Problem Solving: Apply Area and Perimeter Formulas

Essential Question:
How can you use area and perimeter formulas for rectangles to solve problems?
4.MD.3

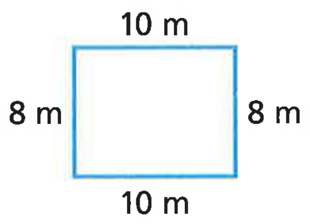
Words to Know:
length
width
formula

Guided Instruction

In this lesson you will learn how to apply area and perimeter formulas to different problem situations.

Understand: Perimeter formulas for rectangles

The model at the right shows the distances of the park where Tate rides his scooter every Saturday. This Saturday Tate forgets to charge the battery for his electric scooter. He rides the scooter all the way around the park only once before the battery dies. How many meters is Tate able to ride the scooter?



To find out how far Tate rides, find the perimeter of the rectangular park. Perimeter is the total distance around a figure or shape.

One way to find the perimeter is to add the measures of all the sides. The measure of each side in one pair of opposite sides is called the length of the rectangle. The measure of each side in the other pair is called the width. Write an addition equation:

Remember! Opposite sides of a rectangle are sides that do not intersect.

$$\textit{Perimeter} = \overset{\text{length}}{10\text{m}} + \overset{\text{length}}{10\text{m}} + \overset{\text{width}}{8\text{m}} + \overset{\text{width}}{8\text{m}} = 36 \text{ meters}$$

➡ Tate rides his scooter 36 meters.

Since the opposite sides of a rectangle are the same length, you add the same length and width twice. This means you can also multiply to find the perimeter of a rectangle. You can:

Double the length and double the width. Then add.

$$\begin{aligned}\textit{Perimeter} &= (2 \times \overset{\text{length}}{10}) + (2 \times \overset{\text{width}}{8}) \\ &= 20 + 16 \\ &= 36 \text{ meters}\end{aligned}$$

or Use the Distributive Property. Add the length and width, and multiply the sum by 2.

$$\begin{aligned}\textit{Perimeter} &= 2 \times (\overset{\text{length}}{10} + \overset{\text{width}}{8}) \\ &= 2 \times 18 \\ &= 36 \text{ meters}\end{aligned}$$

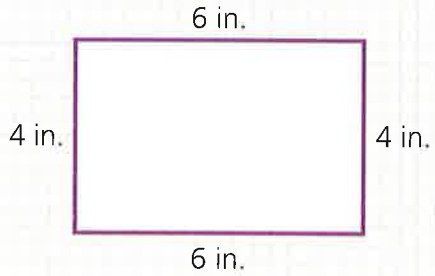
These methods work for all rectangles, so we describe each method with a formula. A formula is a rule that is written with symbols, such as ℓ for length and w for width. To find the perimeter you can use these formulas.

$P = \ell + \ell + w + w$ $P = (2 \times \ell) + (2 \times w)$ $P = 2 \times (\ell + w)$

Guided Instruction

Understand: Area formula for rectangles

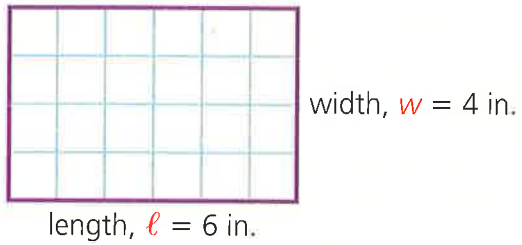
Nicole is using a favorite photograph to cover a magnet she is making. The length and width of her photograph are shown at the right. Nicole glues the photo onto a magnetic sheet that is the same size as the photograph. How many square inches of a magnetic sheet does Nicole use to cover the whole back of the photo?



Since the photo is a rectangle, you can multiply its length and width to find its area.

$$\begin{aligned} Area &= \overset{\text{length}}{6\text{in.}} \times \overset{\text{width}}{4\text{in.}} \\ &= 24 \text{ square inches} \end{aligned}$$

It takes 24 inch squares (1 inch on each side) to cover the rectangle. The area is 24 square inches.



➡ Nicole uses 24 square inches of a magnetic sheet.

The formula for the area of a rectangle is

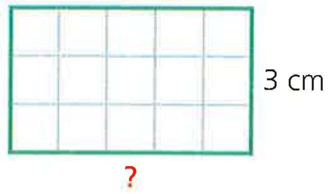
$$A = \ell \times w.$$

You can use this formula to find the area of any rectangle, including squares.

If you know the area of a rectangle, you can also use the formula to find an unknown side length.

$$15 \text{ square inches} = 3 \times ?$$

$$15 \div 3 = 5$$



Write another factor pair for each area that you found above.

Guided Instruction

Connect: Using formulas for perimeter and area

A gardener has 30 feet of bricks that he can use to make the border of a rectangular garden. He will place bricks along each edge and place lights in the corners. The gardener wants to make the garden 5 feet wide. What is the greatest possible length for the garden? What will the area of a garden be with these measurements?

Perimeter formulas

$P = \ell + \ell + w + w$

$P = (2 \times \ell) + (2 \times w)$

$P = 2 \times (\ell + w)$

Area formula

$A = \ell \times w$

You can use the formula for the perimeter of a rectangle to find the length of the garden, and then find its area.

Step 1

Identify the information given and what you need to find in the problem. The perimeter of the rectangle is 30 feet. The width of the rectangle is 5 feet.

You need to find the length of the largest rectangle that the gardener can make with 30 feet of bricks.

Step 2

Write an equation to represent the problem. You know that the perimeter is 2 times the sum of the length and the width. So, half of the perimeter equals the sum of the length and width. Half of the perimeter is 15.

Perimeter

$30 = 2 \times (\ell + 5)$,

so $15 = \ell + 5$.

Step 3

Solve the equation $15 = \ell + 5$ to find the unknown length.

$\ell = 10$

Check that the length ℓ of 10 feet will give you a perimeter of 30 feet.

$2 \times (10 + 5) = 2 \times 15 = 30$,
so 10 feet is correct.

Step 4

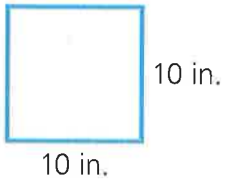
Now use the length of 10 feet to find the area of the garden.

$$\text{Area} = \overset{\text{length}}{10} \times \overset{\text{width}}{5}$$
$$= 50 \text{ square feet}$$

➡ The greatest possible length for the garden is 10 feet. The garden will have an area of 50 square feet.

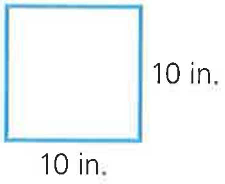
Guided Practice

Write an equation to find the area or perimeter of the rectangle. Outline the border or color the inside of the rectangle to represent your answer.



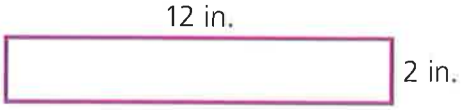
1. Find the distance around all four sides of the rectangle.

Equation ______________ **Perimeter** ______________



2. Find how many inch squares will cover the entire rectangle.

Equation ______________ **Area** ______________



For exercises 3 and 4, use the figure at the right. Write an equation to represent each. Then solve.

3. Peter is making bumper stickers for his baseball team. How much sticky paper does Peter need to make each sticker?

Find the __________ of the rectangle.

Equation ______________________________

Answer ______________________________

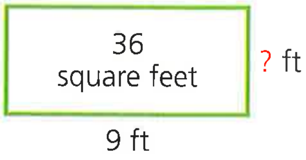
4. Peter decides to glue plastic string along the edge of each sticker. How much string will Peter need for all four sides?

Find the __________ of the rectangle.

Equation ______________________________

Answer ______________________________

Think • Pair • Share



MP1 5. The area of a storage room floor is 36 square feet. Nancy knows that the length of the room is 9 feet long. She wants to buy shelves to fit all the way across the width of the room. What is the width of the room?

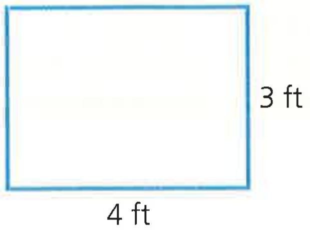
Find the __________ of the rectangle.

Equation ______________________________

Answer ______________________________

Independent Practice

For exercises 1–3, find the area and perimeter of the rectangle at the right.



1. *Area* = *length* × *width*

= ____ × ____

= ____

The area of the rectangle is ____ ____________ feet.

2. *Perimeter* = (2 × *length*) + (2 × *width*)

= (2 × ____) + (2 × 3)

= ____ + ____

= ____

The perimeter of the rectangle is ____ feet.

3. Use a different method to find the perimeter of the rectangle. Add the lengths of all four sides.

____

Draw and label a model and then write an equation to represent the problem. Use *P* or *A* to represent what you need to find. Then solve the equation and answer the question.

Perimeter formulas

$P = \ell + \ell + w + w$

$P = (2 \times \ell) + (2 \times w)$

$P = 2 \times (\ell + w)$

Area formula

$A = \ell \times w$

4. An architect is designing a wall of square windows. The wall is 20 feet wide and 10 feet high. How many squares of glass will fill the window if each square is 1 foot square?

Equation ________________________

Answer ________________________

5. Shelby wants to wrap a string of small lights around the border of her bedroom window. Her window is 2 feet wide and 4 feet tall. How many feet of stringed lights does Shelby need to go around the whole window?

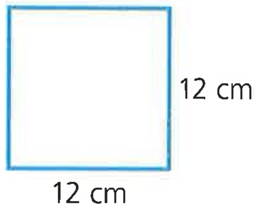
Equation ________________________

Answer ________________________

Independent Practice

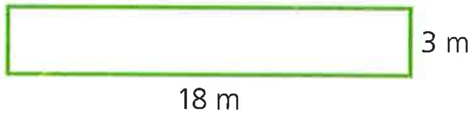
Find the perimeter of the rectangle or square. Write an equation and show your work.

6.



Perimeter ______________

7.



Perimeter ______________

8. a rectangle 17 inches long and 11 inches wide

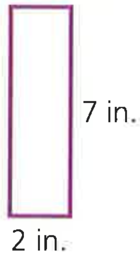
Perimeter ______________

9. a square with side length 25 feet

Perimeter ______________

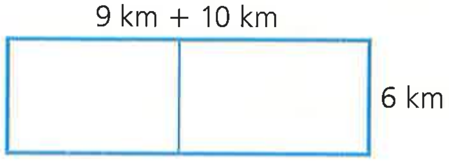
Find the area of the rectangle or square. Write an equation and show your work.

10.



Area __________ square inches

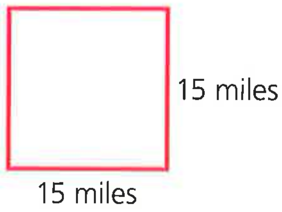
11.



Area ______________

12. a square with side length 15 miles

Area ______________



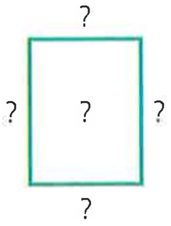
13. a rectangle 16 inches long and 5 inches wide

Area ______________

Independent Practice

MP2 **14.** Ralph draws a square and writes the equations $P = 16$ inches and $A = 16$ square inches. George says that Ralph has made a mistake because the perimeter and the area can never have the same number. Do you agree or disagree with George?

MP7 **15.** What is the least amount of information that you need to find an unknown length of a side in a given rectangle, such as the one shown at the right?



Solve the problems.

MP5 **16.** The fourth graders are having a class party at school. To make one big rectangular table for everyone to sit at, they push two tables together. One table is 8 feet long and 5 feet wide and the other table is a square, 5 feet on each side. What is the perimeter of the combined table that the students make?

Show your work.

Answer ____________________

MP1 **17.** Lisa is choosing new carpet for her bedroom floor. Her bedroom is 12 feet long and 10 feet wide. If the carpet costs $5 per square foot, how much will a carpet to cover Lisa's whole bedroom floor cost?

Show your work.

Answer ____________________

Independent Practice

MP5 **18.** The fabric store sells scrap pieces of fabric that are all 1 yard wide. A rectangular piece is labeled "9 square yards." How long is this piece of fabric? Sketch the rectangle to help you find the unknown side length.

Show your work.

Answer ____________________

MP4 **19.** A town is placing a wire fence around a rectangular field. The town orders 100 yards of fencing, which is the exact amount needed to surround the entire field. One end of the field is 30 yards long. What are the lengths of the other three sides of the field?

Show your work.

Answer ____________________

MP7 **20.** Gary's mother is replacing the tiles in a rectangular section of the bathroom floor. Each tile is square with an area of 4 square inches. Gary's mother uses 32 tiles (without cutting any tiles). Gary says that there is only one possible length and width for the rectangular section of the floor. His friend Angela says that there is more than one possible rectangular shape. Who is correct?

Answer ____________________

Justify your answer using words, drawings, or numbers.

MP7 **21.** Tabitha is drawing models of rectangles that have a perimeter of 4 yards. Each side length is a whole number of feet. How many different models can Tabitha draw?

Answer ____________________

Justify your answer using words, drawings, or numbers.

Lesson

30 Problem Solving: Use Line Plots

Guided Instruction

Essential Question: How can representing data on a line plot help you to better understand and interpret a set of measurements?

4.MD.4

Words to Know:
line plot
data

In this lesson you will learn how to display measurements on a line plot and make observations about the data.

Understand: Using number lines to display data

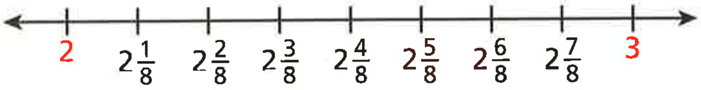
Debbie collects some red leaves from a maple tree. She is surprised to see that the leaves are different lengths, even though they are from the same tree. Debbie measures the leaves to the nearest eighth of an inch. How can you display her data in a more organized way?

Maple Leaf Lengths (to nearest $\frac{1}{8}$ inch)

$2\frac{5}{8}$	$2\frac{2}{8}$	$2\frac{6}{8}$	$2\frac{4}{8}$
$2\frac{4}{8}$	$2\frac{4}{8}$	$2\frac{6}{8}$	2
3	$2\frac{1}{8}$	3	$2\frac{3}{8}$

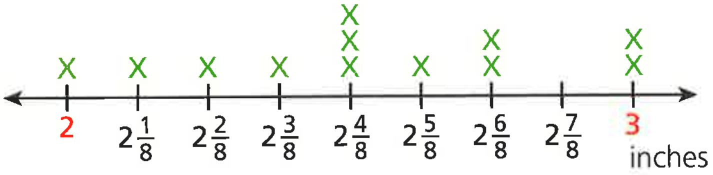
You can organize and display data with a line plot. A line plot uses symbols or marks to show how many times each number, or measurement, appears in a set of data. The numbers or measurements are shown along a number line.

The least and greatest measurements in Debbie's data are 2 inches and 3 inches. Draw and label a number line to show these numbers. Use tick marks and labels to show all the $\frac{1}{8}$-units in between.



Now display the data. Draw an X above the location on the number line for each piece of data. If a piece of data appears more than once, draw an X above the previous X for each.

Maple Leaf Lengths



Title the line plot and label the number line with the units used.

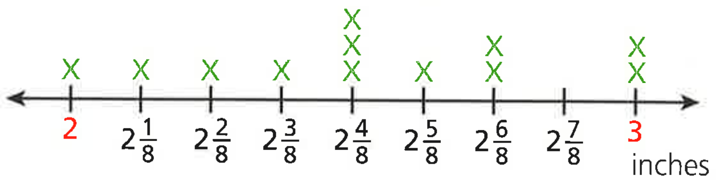
➡ The line plot shows the data in a more organized way.

Understand: Reading and using line plots

What information can you learn from the line plot of Debbie's leaf data?

The line plot shows all 12 of Debbie's measurement data in order from least to greatest number of inches.

Maple Leaf Lengths



Maple Leaf Lengths (to nearest $\frac{1}{8}$ inch)

$2\frac{5}{8}$	$2\frac{2}{8}$	$2\frac{6}{8}$	$2\frac{4}{8}$
$2\frac{4}{8}$	$2\frac{4}{8}$	$2\frac{6}{8}$	2
3	$2\frac{1}{8}$	3	$2\frac{3}{8}$

Looking at the line plot, some of the things you can learn are:

- There are 12 Xs so there are 12 measurements altogether.
- All of the leaves are between 2 and 3 inches long.
- There are 2 leaves that are $2\frac{6}{8}$ inches long and 2 leaves that are 3 inches long.
- Three leaves are $2\frac{4}{8}$ inches long.
- No leaves are $2\frac{7}{8}$ inches long.

Use the information in the line plot to answer these questions.

- Where would you draw the X for a leaf that measures $2\frac{1}{4}$ inches long? Explain.
- How many of Debbie's leaves are longer than $2\frac{1}{2}$ inches? How do you know?
- What is the difference between the longest leaf and the shortest leaf that Debbie measured?

Lesson 30 Problem Solving: **Use Line Plots**

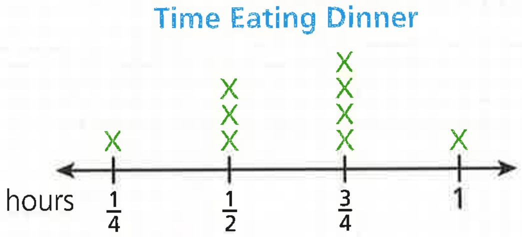
Guided Instruction

Connect: Displaying and interpreting data

Devan asks some friends how much time they spend eating dinner. He asks them to give their answers to the nearest quarter hour. Devan records their answers in a line plot. What is the difference between the greatest amount of time and the least amount of time?

Time Eating Dinner
(to nearest $\frac{1}{4}$ hour)

$\frac{3}{4}$	$\frac{1}{2}$	$\frac{1}{4}$
$\frac{1}{2}$	1	$\frac{3}{4}$
$\frac{3}{4}$	$\frac{3}{4}$	$\frac{1}{2}$

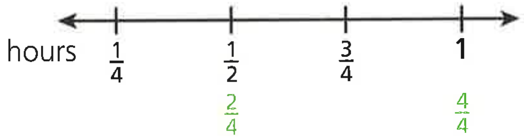


You can use the line plot to answer the question.

Step 1

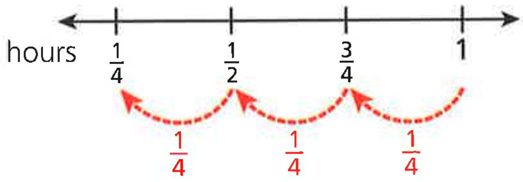
Look at the number line used for the line plot.

The number with the least value is $\frac{1}{4}$, and the number 1 has the greatest value. All of the points on the line are the same distance apart, so, Devan used fourths as the scale.



Step 2

Use the number line on the line plot to find the difference between the greatest amount of time and the least amount of time.



$\frac{4}{4} - \frac{1}{4} = \frac{3}{4}$

The difference between the greatest amount of time spent eating and the least amount of time is $\frac{3}{4}$ hour.

Guided Practice

For exercises 1–4, use the data shown at the right.

Amount of Rain for Rainy Days in May (in inches)

$\frac{3}{4}$	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{1}{2}$
$\frac{1}{8}$	$\frac{1}{4}$	$\frac{3}{4}$	$\frac{1}{8}$

1. Use the smallest unit to rename the amounts of rain as equivalent fractions.

$\frac{1}{4}$ inch = $\frac{\quad}{8}$ inch

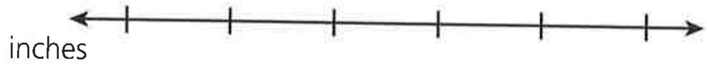
$\frac{1}{2}$ inch = $\frac{\quad}{8}$ inch

$\frac{3}{4}$ inch = $\frac{\quad}{8}$ inch

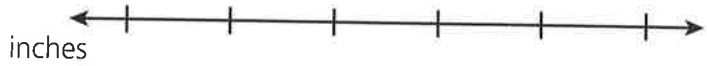
2. Find the least and greatest amounts of rain in the data.

Least amount: ____ inch Greatest amount: ____ inch

3. Label the number line below to show the $\frac{1}{8}$-inch units.



4. Display the data. Then write a title for the line plot.



Use your line plot to solve the problems.

5. What is the total number of days that it rained in May?

There are ____ Xs on the line plot. It rained on ____ days.

6. What is the difference between the greatest and least amounts of rain?

$\frac{6}{8}$ − ____ = ____ inch

Think • Pair • Share

MP1 **7.** Use the line plot to find the total amount of rain for rainy days in May. Explain your method.

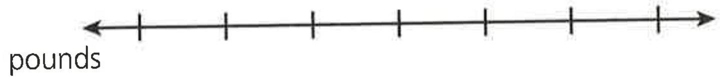
Independent Practice

1. Complete the line plot to display the given data.

Weight of Packages of Cheese (in pounds)

$\frac{7}{8}$	$\frac{2}{8}$	$\frac{1}{8}$
$\frac{2}{8}$	$\frac{7}{8}$	

Weight of Packages of Cheese



2. Write the weights of the packages of cheese in order from least to greatest.

____

3. How many packages were weighed? ____ packages

4. What is the weight of the lightest package? ____ pound

5. What is the weight of the heaviest package? ____ pound

6. What is the difference in the weights of the heaviest and lightest packages?

____ ____ ____

____

Solve the problem.

MP5 **7.** Susie recorded the distances for her walks. The numbers of miles are shown at the right. To show this data on a line plot, what numbers should Susie use on the number line? Explain.

Distance Walked in One Week (in miles)

$1\frac{1}{2}$	$1\frac{1}{4}$	$1\frac{3}{4}$	$1\frac{1}{2}$
$1\frac{1}{4}$	$1\frac{3}{4}$	$1\frac{1}{2}$	$1\frac{1}{4}$

Independent Practice

MP2 **8.** Adam measured the lengths of the pencils in his desk. Make a line plot to display his data.

Pencil Lengths (in inches)

$3\frac{1}{2}$	4	$5\frac{1}{2}$	4
4	$5\frac{1}{2}$	2	$6\frac{1}{2}$

For exercises 9–14, use the line plot from exercise 8 to answer the questions.

9. How many pencils does Adam have altogether?

____

10. How many more 4-inch long pencils are there than 2-inch long pencils?

____

11. How much longer is Adam's longest pencil than his shortest pencil?

____

12. What is the total length of the pencils longer than 4 feet?

____

13. What is the combined length of all of the pencils?

____

14. Adam finds another pencil that is $2\frac{2}{4}$ inches long in his backpack. Which of these best describes how Adam should change his line plot to include this data?

a. He should add another tick mark for $2\frac{2}{4}$ on the number line.

b. He should add another tick mark for $\frac{10}{4}$ on the number line.

c. He should add 1 X above $2\frac{1}{2}$ inches.

d. He should extend the number line and draw 2 Xs above $\frac{1}{2}$.

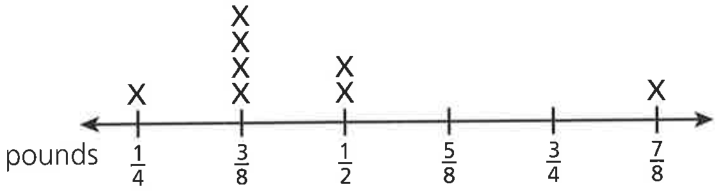
Independent Practice

MP3 **15.** George is making a line plot to show the ages of children in a music group. He lists the ages in years: 13, $10\frac{1}{2}$, $13\frac{1}{2}$, 12, 14, 13, $10\frac{1}{2}$. He says that the number line on his line plot will have exactly 5 tick marks. Mandy says that the number line will show exactly 7 tick marks. Liz says that it must show at least 8 tick marks. Who is right? Explain. What numbers will the number line show?

MP6 **16.** Lisa is trying to choose a name for her new kitten. She writes her four top choices and then asks each of her 12 friends to choose one of the names. She places an X above the name that each friend chooses. Her friend Sandy says that Lisa is making a line plot. Lisa says that it is not really a line plot. Who is right?

For exercises 17 and 18, use the line plot.

Weight of Apples in 1 Bag



MP1 **17.** How much heavier is the heaviest apple in the bag than the lightest apple?

Show your work.

Answer ____________________

MP1 **18.** How much does the whole bag of apples weigh?

Show your work.

Answer ____________________

Independent Practice

For exercises 19–21, use the data below.
Michelle reads that 1 yard is about the distance from the tip of your nose to your fingertip, with your arm stretched out to your side. She measures this length for herself and some other people. The list below shows Michelle's data.

Distance from Nose to Fingertip (feet)

$2\frac{4}{6}$	$2\frac{1}{6}$	$2\frac{4}{6}$	$2\frac{2}{6}$	$2\frac{2}{6}$	3	$2\frac{3}{6}$	$2\frac{4}{6}$	3	$2\frac{2}{6}$	2

MP5 **19.** Make a line plot of Michelle's measurement data.

Show your work.

Answer

MP4 **20.** Michelle makes a line plot for her data that starts at 2 feet and ends at 3 feet. Does the number line for Michelle's plot still represent the size of each measurement as a distance from 0 feet?

Answer ______________________________

Justify your answer using words, drawings, or numbers.

MP2 **21.** Based on Michelle's data, is the distance from your nose to your fingertip a good estimate of one yard?

Answer ______________________________

Justify your answer using words, drawings, or numbers.

Lesson

31 Understand Angle Measures

Essential Question:
How is the measure of an angle related to a circle?

4.MD.5a; 4.MD.5b

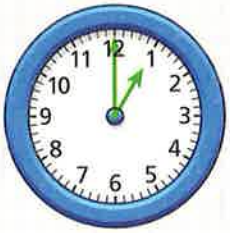
Words to Know:
- **ray**
- **point**
- **endpoint**
- **angle**
- **vertex**
- **degree (°)**
- **one-degree angle**
- **right angle**
- **straight angle**

Guided Instruction

In this lesson you will learn about angles and angle measures.

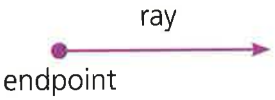
Understand: Angles and parts of angles

The positions of the hands of a clock show the time. What geometric figure do the two hands of a clock form?

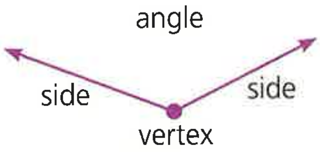


To decide what geometric figure is formed by a clock's hand, you need to learn about rays and angles.

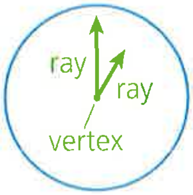
A ray starts at a point called an endpoint and goes on straight in one direction forever.



Two rays that share the same endpoint form an angle. The two rays of an angle are the sides of the angle. Their shared endpoint is the vertex of the angle.

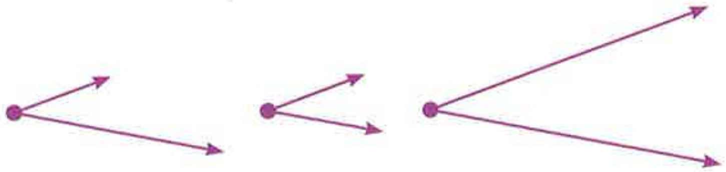


The hour and minute hands of the clock are like two rays that begin at the same point. That point in the center of the clock is like the vertex of an angle.



▶ The two hands of a clock form an angle.

Changing the length of the sides of an angle does not change the angle measure.
The angles below are all the same size as the clock angle.

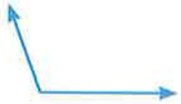


Trace one of the angles. Then move the traced angle to match the vertex and rays of another angle. What do you notice?

Guided Instruction

Understand: Angle measures and fractions of a circle

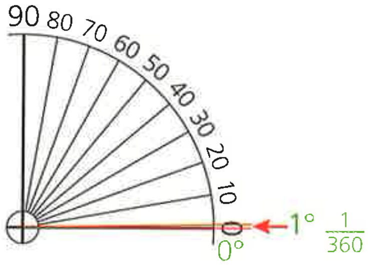
Carrie opens her laptop computer to the angle shown at the right. What is the measure of the angle of Carrie's open laptop?



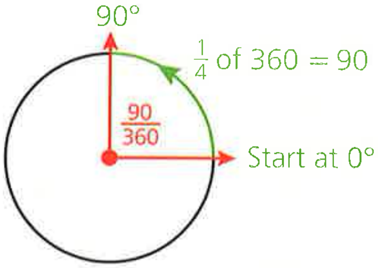
To answer this question, you need to find an angle measure. The unit of measure for angles is the degree and its symbol is °.

Think of the vertex of an angle as the center of a circle. An angle forms as it turns through the circle. A circle measures 360 degrees, so a one-degree angle is $\frac{1}{360}$ of a circle. The measure of an angle is the number of one-degree angles it turns through.

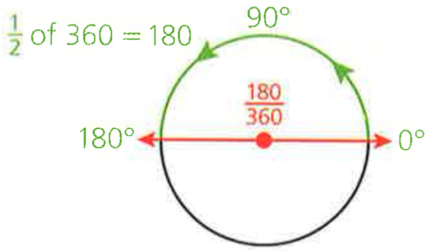
A one-degree angle turns through just $\frac{1}{360}$ of a circle.


90 80 70 60 50 40 30 20 10 0
0°
1° $\frac{1}{360}$

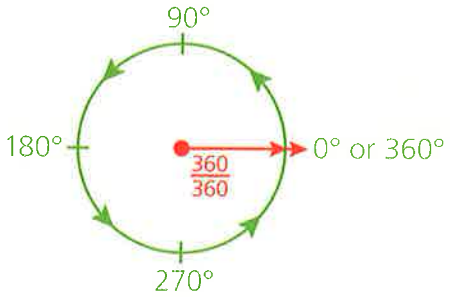
A 90° angle turns through $\frac{90}{360}$, or $\frac{1}{4}$, of a circle. This is a right angle.


90°
$\frac{1}{4}$ of 360 = 90
$\frac{90}{360}$
Start at 0°

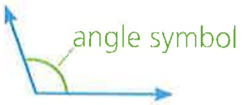
A 180° angle, or straight angle, turns through $\frac{1}{2}$ of a circle. The rays of a straight angle form a line.


$\frac{1}{2}$ of 360 = 180
90°
$\frac{180}{360}$
180°
0°

A 360° angle turns through a whole circle. One ray rests on top of the other.

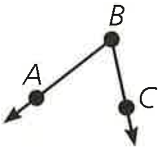

90°
180°
0° or 360°
$\frac{360}{360}$
270°

When Carrie opens her laptop, she turns the cover through 110 one-degree angles. The angle it forms measures 110°.


angle symbol

➡ The measure of the angle of Carrie's open laptop is 110°.

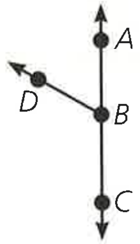
To name an angle, use the symbol ∠. Write the letter for a point on one ray and the letter for the vertex followed by the letter for a point on the other ray. This angle is ∠ABC or ∠CBA. A short form is ∠B.



Guided Instruction

Connect: Identify angles and angle measures in degrees

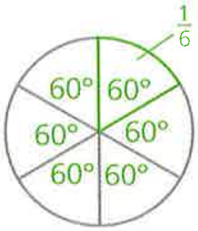
One of the angles in the figure at the right turns through $\frac{1}{6}$ of a circle. What is the size of this angle? What part of the figure shows this angle?



To identify the angle size and matching angle in the figure, use what you know about the degrees in a circle.

Step 1

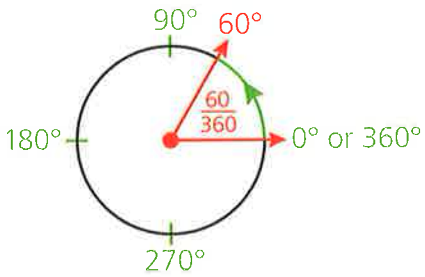
Find the number of one-degree angles in $\frac{1}{6}$ of a circle.
Think: One whole circle has 360 one-degree angles.



You can multiply to find $\frac{1}{6}$ of 360.

$\frac{1}{6} \times 360 = \frac{1 \times 360}{6} = \frac{360}{6} = 60$ one-degree angles

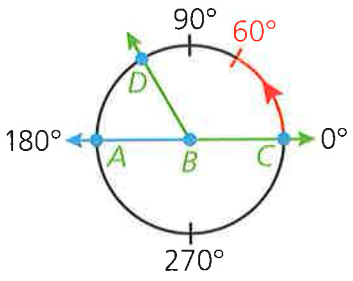
Since each one-degree angle is 1°, 60 one-degree angles equal 60°.



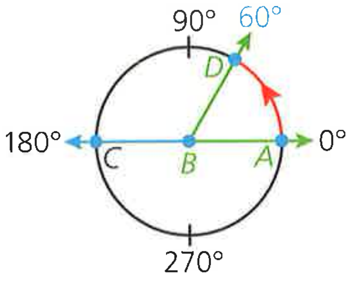
▶ The angle that turns through $\frac{1}{6}$ of a circle is a 60° angle.

Step 2

Identify which angle in the figure is the 60° angle.
Use the points on the rays to name the angles.

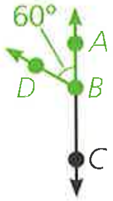


Angles *DBC* and *ABC* are both greater than 60°.



Angle *DBA* measures 60°.

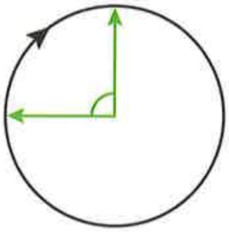
▶ The part of the figure that shows the 60° angle is angle *DBA*.



Guided Practice

Name the measure of the angle for the fraction of a circle.

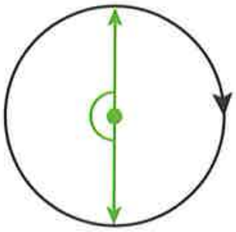
1.



$\frac{1}{4} = \frac{\quad}{360}$

Angle measure ____°

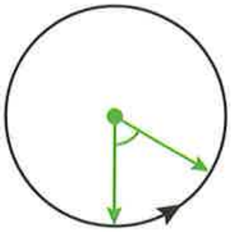
2.



$\frac{1}{2} = \frac{\quad}{360}$

Angle measure ____°

3.

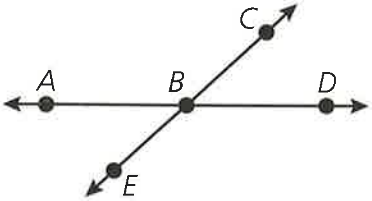


$\frac{1}{6} = \frac{\quad}{360}$

Angle measure ____°

Use the words at the right to complete the sentences. Then name an example in the figure at the right.

vertex
right angle
ray
straight angle



4. A ____________ measures 180°.

Example ______________________________

5. The point shared by two rays to form an angle is called the ____________.

Example ______________________________

6. A ____________ is a line with one endpoint that goes on forever in one direction.

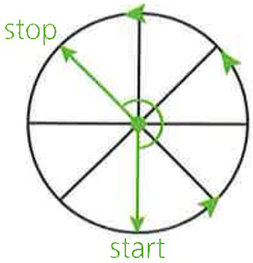
Example ______________________________

7. Angle *ABC* has a greater measure than a ____________.
Name another angle that turns through more than 90 one-degree angles.

____

Think • Pair • Share

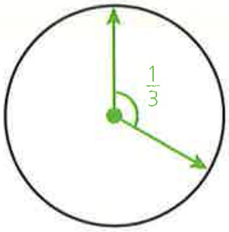
MP2 **8.** Shelly rides the Ferris wheel at the carnival. Her car moves $\frac{5}{8}$ of the way around the whole circle when the ride stops to let other people on. What is the measure of the angle between the starting and stopping point? Explain your solution.



Independent Practice

Name the measure of the angle for the fraction of a circle.

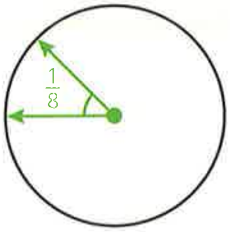
1.



$\frac{1}{3} = \frac{}{360}$

Angle measure ____°

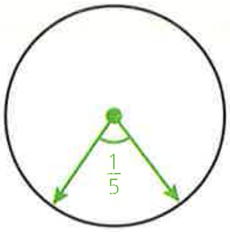
2.



$\frac{1}{8} = $ ___

Angle measure ____°

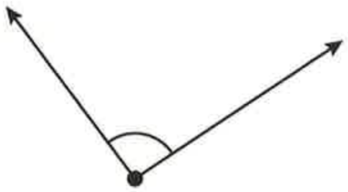
3.



$\frac{1}{5} = $ ___

Angle measure ____°

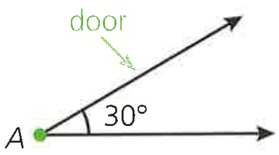
4. Identify the parts of the angle below.

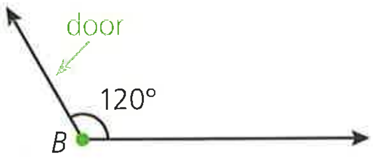


5. The table shows the angle between the hour and minute hand of a clock at different times of the day. Write the missing angle measures to complete the table.

Time	Angle
1:00	30°
2:00	
3:00	

6. Angles *A* and *B* represent a door opening into a room.





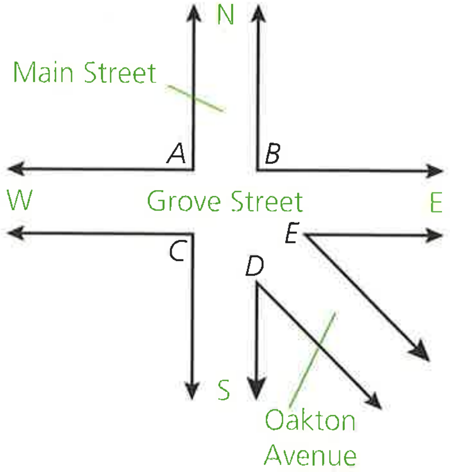
a. Compare the measures of the angles and the number of one-degree angles for each.

b. Describe the relationship between the sizes of the angles.

Independent Practice

For exercises 7–9, use the figure.

Street Intersection



7. A car drives south along Main Street and makes a 90° turn onto Grove Street. Name two angles that can represent the corner where the car turns.

____

8. Which angles represent sharp turns that measure less than a right angle?

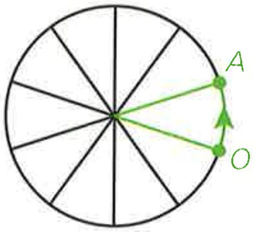
____

9. A car drives through the intersection along a straight angle. Which street or streets is the car driving on?

____

Circle the correct answer.

10. A fin on a windmill moves from point *O* to point *A*. As it moves, it turns through $\frac{1}{10}$ of a circle. What is the measure of the angle?



a. 10°

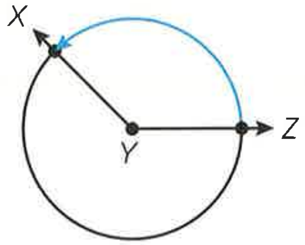
b. 36°

c. 90°

d. 100°

Independent Practice

11. What is the measure of $\angle XYZ$?



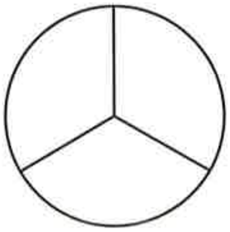
a. between 0° and 90°

b. exactly 90°

c. between 90° and 180°

d. exactly 180°

12. The circle is divided into 3 equal sections. For each section, name the fraction of the circle and the measure of the angle.



a. $\frac{1}{3}$, 60°

b. $\frac{1}{3}$, 120°

c. $\frac{1}{9}$, 40°

d. $\frac{1}{9}$, 90°

Solve the problems.

MP7 **13.** The table below shows the relationship between angle measures and sections of a circle. Complete the table.

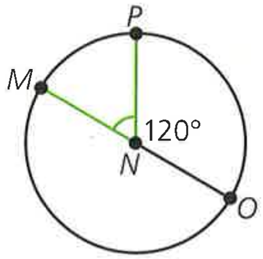
Angle Measure	Circle Section
40°	
72°	$\frac{1}{5}$
	$\frac{1}{4}$
120°	
	$\frac{1}{2}$

Show your work.

Independent Practice

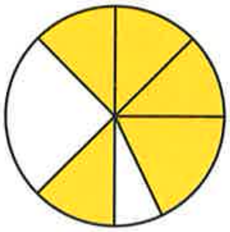
MP7 **14.** What is the measure of angle *MNP*?

Show your work.



Answer ____

MP3 **15.** Mark is taking leftover slices of pizza from different boxes and putting them into one box. The 5 leftover pizza slices are shown below in gold.



Are all the gold slices shown the same size?

Answer ____

Justify your answer using words, drawings, or numbers.

MP1 **16.** Kendra's bicycle wheels cover a distance of about 6 feet with each full turn. She bikes two blocks and covers a distance of 420 feet. Kendra says that her wheels turned 2,520 times during her ride. Is Kendra right?

Answer ____

Justify your answer using words, drawings, or numbers.

Lesson

32 Use a Protractor to Measure Angles

Guided Instruction

Essential Question: How can classifying angles and using a protractor help you measure angles?

4.MD.6

Words to Know:
- acute angle
- perpendicular
- obtuse angle
- protractor

In this lesson you will learn how to measure and draw angles using a protractor.

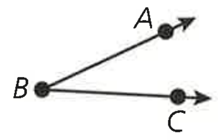
Understand: Classifying angles by size

Meg says that there are only three types of angles: right angles, straight angles, and 360° angles. Is Meg's information correct?

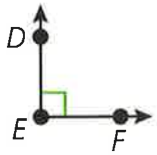
You learned that angle measure is the number of one-degree angles that an angle turns through in a circle. You can classify or group angles by their angle measure.

Remember! Two rays that share the same endpoint form an angle.

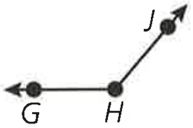
- An acute angle measures between 0° and 90°. Angle *ABC* is an acute angle.



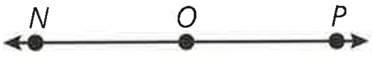
- A right angle is exactly 90°. Angle *DEF* shows the right angle symbol: a square at the vertex. Two rays that meet at a right angle are perpendicular, like the sides of a square or rectangle.



- An obtuse angle measures between 90° and 180°. Angle *GHJ* is an obtuse angle.



- A straight angle measures exactly 180°. Straight angle *NOP* is also a line.



There are more than 3 types of angles, so Meg's information is not correct.

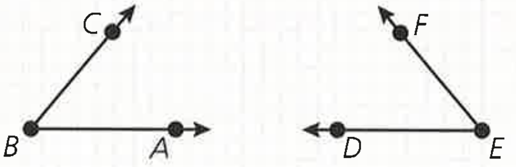
You can use benchmark angles such as right angles and straight angles to help you visualize angles in the problems that you work on.

Explain why there are acute angles with many different angle measures but there is only one angle measure for a right angle.

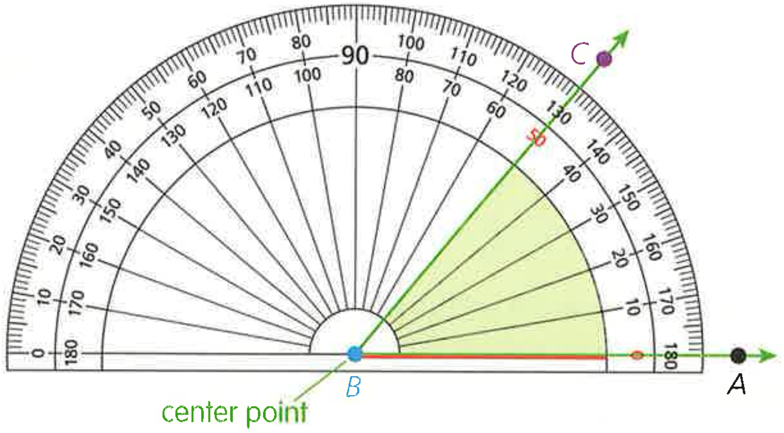
Guided Instruction

Understand: How to measure angles with a protractor

Tim says that the measure of $\angle ABC$ is 50° and the measure of $\angle DEF$ is 130°. Is Tim correct?



To find the exact measure of an angle, you can use a protractor.
A protractor is a tool for measuring the number of degrees in an angle.



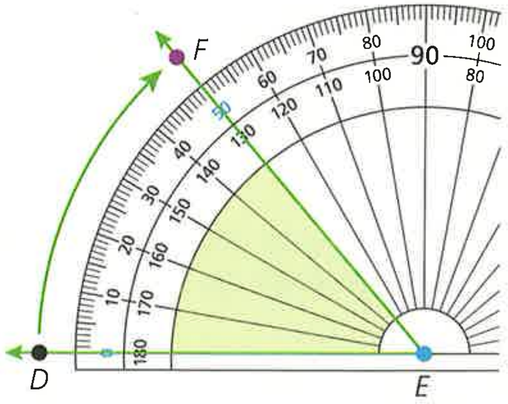
On the protractor, find the center hole at the bottom. Place this directly over the vertex of the angle you are measuring. For $\angle ABC$, this is point B.

Line up one ray of the angle, such as ray BA, with the 0 on the inner number scale. On the inner scale, the degrees increase counterclockwise. When a ray is too short to reach the number scale, use the straight side of the protractor to extend the ray.

A short way to write the measure of angle ABC is $m\angle ABC$.

Look where the other ray of the angle crosses this scale.
Ray BC goes through the tick mark for 50, so $m\angle ABC$ is 50°.

Now measure $\angle DEF$ in the figure at the right.
Place the center point of the protractor over vertex E and line up ray ED with 0 on the outer number scale.
Ray EF goes through 50 on the outer number scale.
The degrees increase clockwise.
On the outer scale, $m\angle DEF$ is 50°, not 130°.

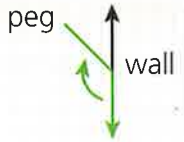


➡ Tim is correct about the measure of $\angle ABC$ but not about the measure of $\angle DEF$. The angles have the same angle measure.

Guided Instruction

Connect: Use a protractor to draw an angle

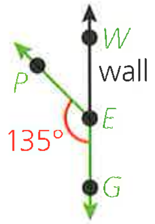
Janna wants to put a peg on the wall to hang her jacket on. She starts to make a sketch of the peg's position. She wants the angle to be 135°. Help Janna draw an angle of 135°.



You can use a protractor to draw the angle.

Step 1

Put more information on Janna's sketch.
Name the angle *PEG*. Let line *WEG* represent the wall.

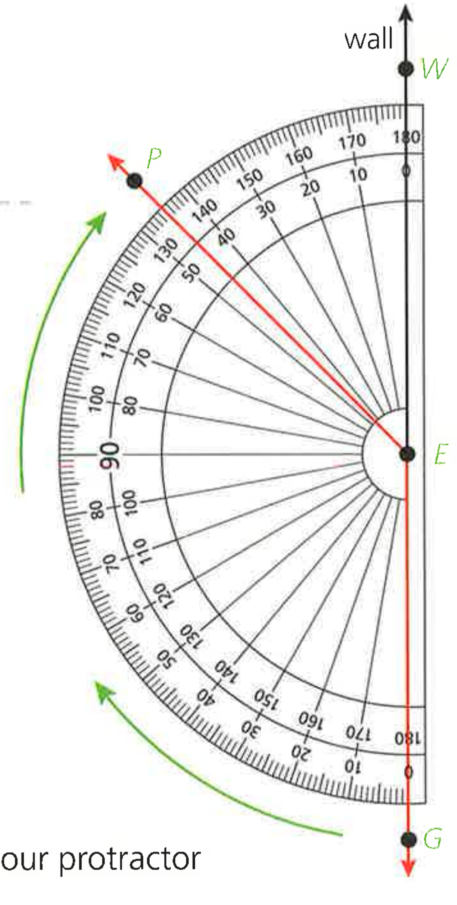


Step 2

Draw ray *EG*.
Use the straight edge of the protractor to draw ray *EG*.
Mark point *E* and draw a ray down from Point *E*. Label any point on the ray *G*.

Step 3

Draw ray *EP*.
Place the protractor over ray *EG*, with the center on *E* and ray *EG* lined up with 0.
Mark point *P* at 135° on the outer number scale.
Draw a ray connecting *P* and *E*.



The three steps show how Janna can draw an angle of 135°.

What is the measure of angle *PEW*?
Straight angle *WEG* measures 180°.
180 − 135° = 45°, so angle *PEW* measures 45°.
Look at the inner number scale to check.

Choose an angle measure between 0° and 180°. Use your protractor to draw the angle on another sheet of paper.

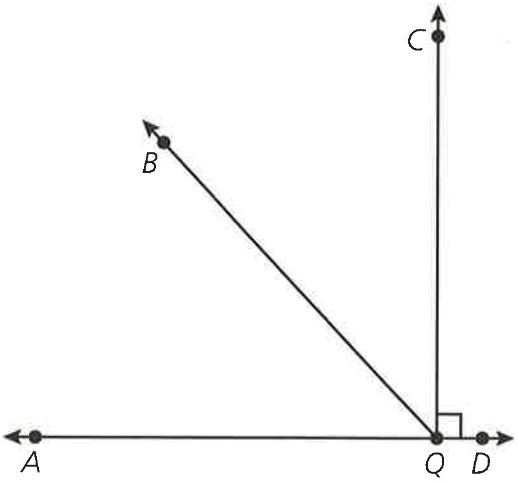
Guided Practice

Match the angle with its description. Use angle benchmarks to help.

1. $\angle AQC$ **a.** acute angle

2. $\angle BQD$ **b.** right angle

3. $\angle AQB$ **c.** obtuse angle



Use a protractor. Find the angle measure.

4. $m\angle AQC$ ______°

5. $m\angle BQD$ ______°

6. $m\angle AQB$ ______°

Sketch an example of each type of angle.

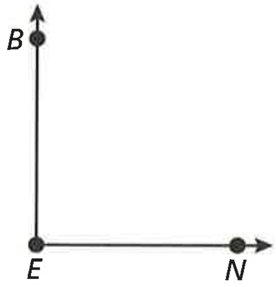
7. acute **8.** straight **9.** obtuse

Use a protractor to draw an angle with the given measure.

10. 90° **11.** 60° **12.** 120°

Think • Pair • Share

MP5 **13.** On this drawing of angle *BEN*, draw two angles: a 45° angle and a 135° angle. Label your angles and explain your method. How are the angles related?

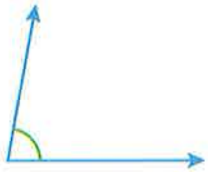


Independent Practice

Use a protractor. Find the angle measure of each. Then identify the type of angle.

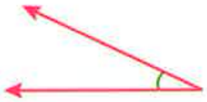
1. **measure** ______

   type ____________



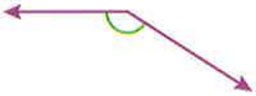
2. **measure** ______

   type ____________



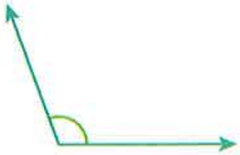
3. **measure** ______

   type ____________



4. **measure** ______

   type ____________



Use a protractor to draw an angle with the given measure.

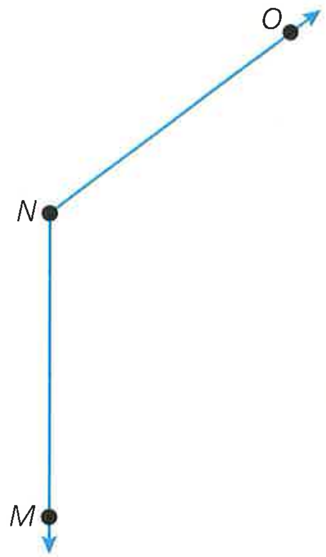
5. 55°

6. 138°

7. 175°

Independent Practice

For exercises 8–9, circle the correct answer.



8. What is the measure of $\angle MNO$?
Use a protractor.

a. 53° **b.** 120°

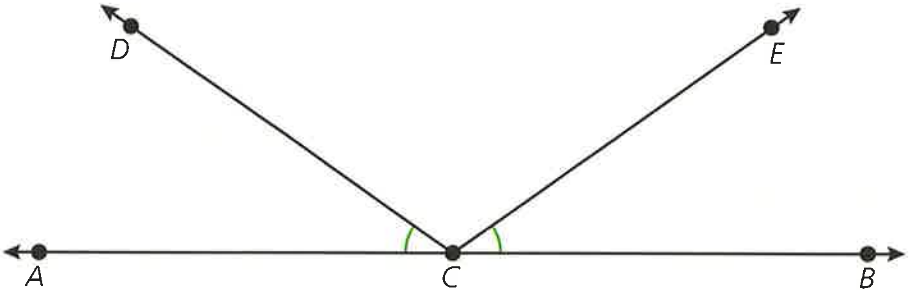
c. 127° **d.** 130°

9. What type of angle is $\angle MNO$?

a. acute **b.** obtuse

c. right **d.** straight

10. Use a protractor to measure angle *ACD* and angle *ECB*.



a. Write the angle measures.

$m\angle ACD$ ______ $m\angle ECB$ ______

b. Complete the sentence. Use *acute*, *right*, *obtuse*, or *straight*.

Angle *ACB* is a ____________ angle.

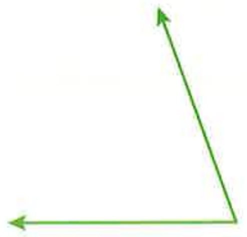
c. Use your protractor to find the measure of angle *DCE*.

$m\angle DCE$ ______

d. Draw angle *DCB*. $m\angle DCB = 145°$

Independent Practice

MP7 **11.** Classify the angle at the right. Use an angle benchmark to explain your reasoning.

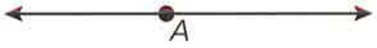


MP3 **12.** Carrie says that if you combine the measures of two acute angles, the new angle is always acute. Do you agree? Give an example to explain your answer.

Solve the problems.

MP5 **13.** On the line below, use a protractor to draw two angles. Use point *A* as the vertex for both angles. Write the measure of each angle below.

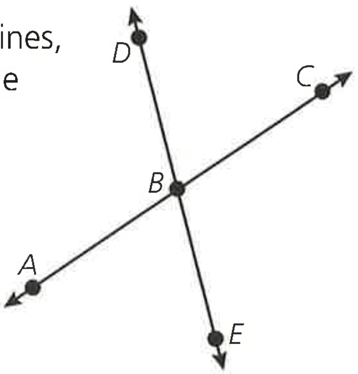
Show your work.



Angle measures ____________________

MP2 **14.** The figure at the right shows the angles formed by two lines, line *AC* and line *ED*. Angle *ABE* measures 70°. What is the sum of the measures of angles *DBC*, *CBE*, and *ABE*?

Show your work.



Answer ____________________

Independent Practice

MP5 **15.** Complete the table. Identify and then sketch each angle.

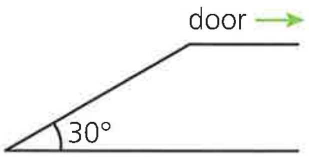
Angle Measure	Angle Type	Sketch
60° + 30°	right angle	
90° + 90°		
30° + 30°		
120° − 20°		

MP4 **16.** George says that if you subtract 185° from an angle that measures 360°, the new angle is an obtuse angle. Is George's thinking correct? Use a protractor to draw a figure supporting your answer.

Answer ______________________________

Justify your answer using words, drawings, or numbers.

MP2 **17.** A store has a ramp up to its back door for deliveries. The ramp is angled at 30° up from the ground, as shown below.



The delivery person says that the ramp is too steep. How can you change the ramp to make it less steep? Draw your new design onto the drawing above.

Answer ______________________________

Justify your answer using words, drawings, or numbers.

Lesson

33 Problem Solving: Find Unknown Angle Measures

Essential Question:
How can you use known relationships between angle measures to solve problems?
4.MD.7

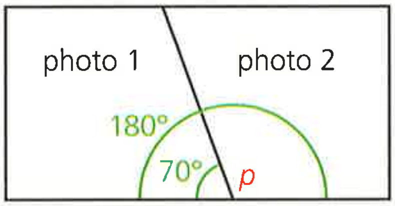
Words to Know:
supplementary angles
complementary angles

Guided Instruction

In this lesson you will learn how to use the relationships between angles to find angle measures and solve problems.

Understand: Supplementary and complementary angles

Tobey is making a photo collage. The bottom right corner of photo 1 is cut at a 70° angle. Tobey wants to fit photo 1 next to photo 2 so that the corners do not overlap or have a gap in between them. At what angle should Tobey cut the bottom left corner of photo 2?



To find the angle measure Tobey needs for photo 2, you can use the relationship between supplementary angles.

Supplementary angles are two angles whose measures add to 180°. When supplementary angles have a side in common, they make a straight angle or line.

Remember!
A straight angle measures 180°.

For Tobey's two photos to fit together perfectly, the angles must be supplementary.

Write an equation that represents the relationship of the angle measures. Use p as the measure of the corner angle of photo 2.

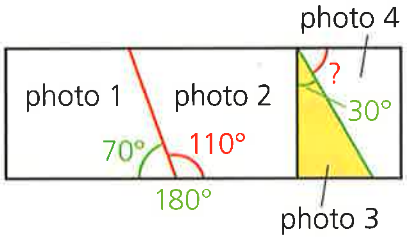
sum of supplementary angles = sum of the two angle measures

$$180° = 70° + p$$
$$180° - 70° = p$$
$$110° = p$$

Tobey should cut the bottom left corner of photo 2 at a 110° angle.

Complementary angles are two angles whose measures add to 90°. When complementary angles have a side in common, they make a right angle.

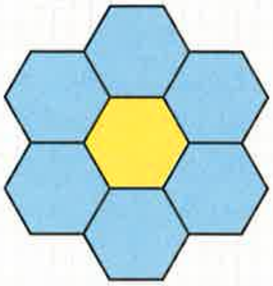
Find the measure of the upper left corner angle for photo 4 in the collage.



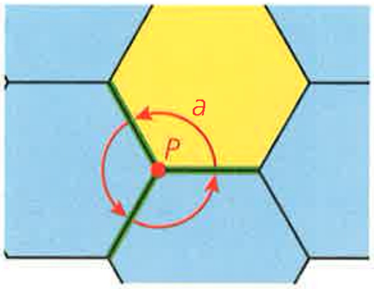
Guided Instruction

Understand: Breaking apart and combining angles

A flower pattern in a quilt is made with identical hexagons. All of the angles in the hexagons have the same measure. What is the measure of each angle in the hexagons?



To find the measure of each angle, you can break apart, or decompose, a 360° angle about any point in the pattern. Then use the information given in the problem and what you know about angles to write and solve an equation.



- The diagram shows that each point in the pattern is a vertex for three hexagons.
- The problem tells you that all of the angles in the hexagons have the same measure.
- A full circle is a 360° angle. At each point in the pattern, a circle is decomposed into 3 equal angles.

The three angles sharing a vertex at a point, P, have a combined measure of 360°. You can use a to represent the unknown measure of one angle.

Write and solve an equation that represents this problem.

$$360° = a + a + a$$
$$360° = 3 \times a$$
$$360° \div 3 = a$$
$$120° = a$$

➧ The measure of each angle in the hexagons is 120°.

Guided Instruction

Connect: Using a drawing and an equation to represent a problem

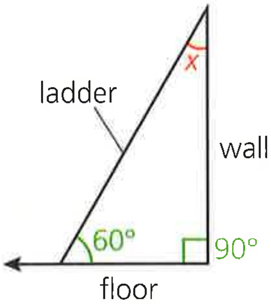
A ladder is leaning against a wall that forms a 90° angle with the floor. The bottom of the ladder makes a 60° angle with the floor. The ladder, wall, and floor form the three sides of a triangle. The combined measure of the angles in a triangle is 180°. What is the measure of the angle between the top of the ladder and the wall?

To find the unknown measure of the third angle, sketch a drawing to represent the problem and write an equation.

Step 1

- Use the given information to represent the problem.
- Sketch the triangle formed by the ladder, wall, and floor.
- Label each of the known angles with the given measures. Use x to represent the unknown angle measure.

To represent a problem situation, you do not need to draw the angles with exact measures.



Step 2

The sum of the measures of the three angles in a triangle is 180°. Write an equation for the sum.

$$\begin{aligned} 180^\circ &= 60^\circ + 90^\circ + x \\ 180^\circ &= 150^\circ + x \\ 180^\circ - 150^\circ &= x \\ 30^\circ &= x \end{aligned}$$

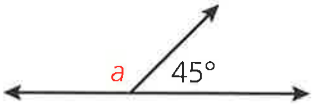
The angle between the top of the ladder and the wall measures 30°.

What is the measure of the angle that is supplementary to the 60° angle from the floor?

Guided Practice

Complete the equation to show the relationship between the angles. Then find the measure of the unknown angle.

1.

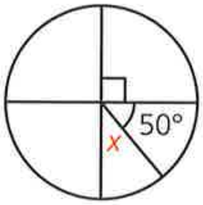


$a + 45° =$ ______

$a =$ ______ $- 45°$

$a =$ ______

2.



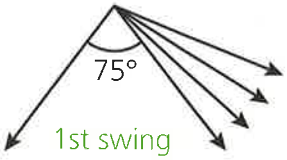
$x + 50° =$ ______

$x =$ ______ $-$ ______

$x =$ ______

Write an equation to represent the problem. Then solve.

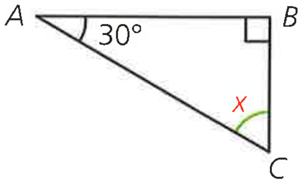
3. Tanya is practicing her golf swing. Her first swing turns through 75° of a circle. For each of her next three tries, the angle of her swing increases by 10°. What is the angle of Tanya's last swing?



$75° + 3 \times$ ______$° = s$

Answer ______

4. Mallory has a triangular wedge of wood. The sum of the angles in the triangle equals 180°. What is the angle measure, x, of the third corner of the wedge?



Answer ______

Think • Pair • Share

MP2 **5.** Draw two angles that share a side and whose measures have a sum of 90°. Explain why both angles are acute.

Independent Practice

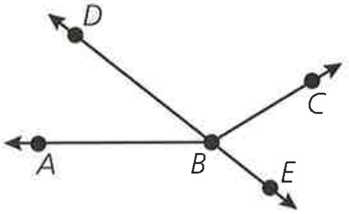
Solve the problems.

1. Write an equation to find the complementary angle of 57°.

x ____ 57° = 90°

x = ____

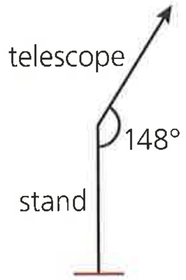
2. The diagram shows three roads that meet at angles.



Name two pairs of supplementary angles.

Write an equation to represent the problem. Then solve.

MP1 **3.** Jerome uses a telescope to look at stars at night. Each night, he increases the angle between the telescope and its stand by 5° to look at a different part of the sky. If this angle is 148° tonight, what was the angle 5 days ago?



148° − __________° = s

Answer ______________________

MP3 **4.** Two angles, ∠*ROE* and ∠*JOE*, share a common side and form a straight angle. The measure of ∠*ROE* is three times that of ∠*JOE*. Find the measure of ∠*ROE* and of ∠*JOE*.

Show your work.

Answer ______________________

Independent Practice

For exercises 5–8, circle the correct answer.

5. Which angle measure is supplementary to a 25° angle?

a. 25° **b.** 65°

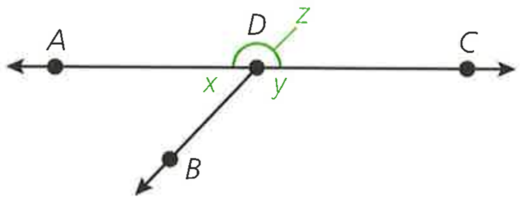
c. 90° **d.** 155°

6. Which of the following pairs of angle measures are not complementary?

a. 45°, 45° **b.** 30°, 60°

c. 20°, 90° **d.** 15°, 75°

7. The figure below shows two supplementary angles.



Which of the following equations shows the relationship between the two angles?

a. $x + z = 180°$ **b.** $x + y = 180°$

c. $z + y = 180°$ **d.** $z - y = 180°$

8. Which of the following statements is true?

a. Two angles whose measures add to 90° must share a side.

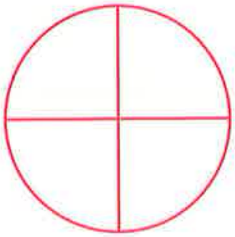
b. Two angles whose measures add to 180° must share a side.

c. Two angles formed by a straight angle always have measures that add to 180°.

d. Two right angles always form complementary angles.

Independent Practice

MP2 **9.** A circle is divided into 4 equal parts. Any two angles formed in this circle are supplementary. Use this information to show that the circle has a total of 360 degrees.

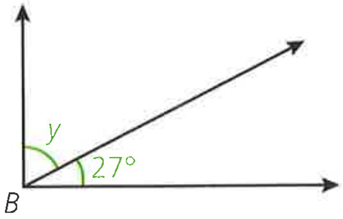


MP6 **10.** Jeremy says that finding an unknown angle measure in a geometric figure is like finding the unknown side length of a rectangle. What do you think Jeremy means by this statement? Do you agree?

Solve the problems.

MP2 **11.** If angle *B* below is a right angle, what is the value of *y*?

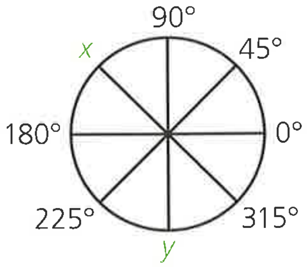
Show your work.



Answer ______________________________

MP7 **12.** A circle is divided into eight equal parts and labeled as shown below. Find the missing angle measures for the figure.

Show your work.



Answer ______________________________

Independent Practice

MP2 **13.** The equation $\frac{110}{360} + \frac{70}{360} = x$ represents fractions of a circle. Solve the equation. Then rewrite it with degree measures instead of fractions of circles. Describe the relationship between the two angles.

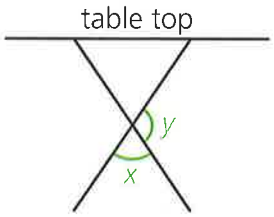
Show your work.

Answer ______________________

MP5 **14.** Draw two angles that are complementary and do not share a side.

Show your work.

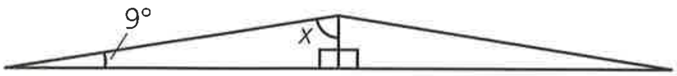
MP3 **15.** Tom builds an adjustable table with legs crossed, as shown at the right. Angles x and y are supplementary angles. As the height of the table is raised or lowered, angle x changes. As angle x changes, angle y changes too. Tom says that when the table is raised or lowered, the measures of angle y and angle x change in the same way. Is this true?



Answer ______________________

Justify your answer using words, drawings, or numbers.

MP4 **16.** The library has two identical entrance ramps that have an angle up from the ground of 9°. The diagram shows the two ramps set back-to-back. Sharon says that the sum $x + 9° = 90°$. Is that true?



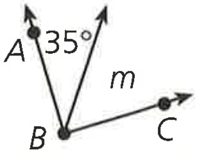
Answer ______________________

Justify your answer using words, drawings, or numbers.

UNIT 4 Common Core Review

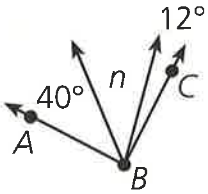
In exercises 1 and 2, ray *BA* and ray *BC* are perpendicular. Find the missing angle.

1.



$m =$ ____

2.



$n =$ ____

Kilograms	Grams
1	
2	
3	
4	
5	

3. Complete the conversion table.

4. How many kilograms is 10,000 grams?

____

Ms. Kohl's gym class measured their standing long jumps to the nearest quarter foot. Their recorded data is shown at the right. Use the data for exercises 5–10.

Long Jumps (ft)

$5\frac{3}{4}$	$5\frac{2}{4}$	$6\frac{1}{4}$	$6\frac{1}{4}$	$6\frac{3}{4}$
7	$5\frac{3}{4}$	$6\frac{1}{4}$	$7\frac{1}{4}$	$6\frac{2}{4}$
$6\frac{2}{4}$	7	$7\frac{1}{4}$	$5\frac{3}{4}$	$6\frac{3}{4}$
$6\frac{3}{4}$	6	$6\frac{1}{4}$	$7\frac{1}{4}$	$7\frac{1}{4}$

MP6 **5.** Make a line plot of the long jump data. Give your line plot a title.

6. How many students had a long jump of $5\frac{3}{4}$ feet? ____________

7. What distance did the most students jump? ____________

8. What was the longest jump? ____________

How many students jumped that far? ____________

9. What was the shortest jump? ____________

How many students jumped that far? ____________

10. What was the difference between the longest and shortest jumps?

____

UNIT 4 Common Core Review

Circle the correct answer.

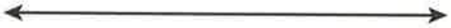
11. How many inches are in 6 ft?

a. $\frac{1}{2}$ in.
b. 12 in.
c. 36 in.
d. 72 in.

12. How many ounces are in 2 pounds?

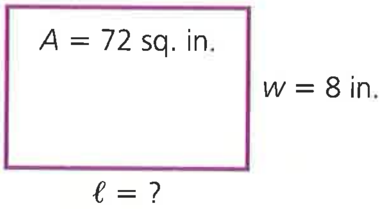
a. 40 oz.
b. 32 oz.
c. 20 oz.
d. 16 oz.

13. Use a protractor to draw a 60° angle on the line at the right. Write the measurement on the figure.



14. What is the length of the rectangle?

Show your work.

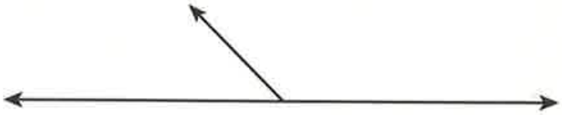


Answer ______________________________

15. A water sprinkler rotates one-degree turn at each interval. If the sprinkler rotates a total of 110°, how many one-degree turns has the sprinkler made?

____

For exercises 16 and 17 use the figure at the right. The two angles form a straight angle.



MP5 **16.** Use a protractor to measure each angle. Write the measurements on the figure.

MP7 **17.** Amilah says that once you find the measure of one of the angles, you can calculate the measure of the other angle without using a protractor. Is she correct? Explain.

Answer ______________________________

UNIT 4 Common Core Review

Solve the problems.

MP4 **18.** The championship game is at 4:15 P.M. It takes the team bus 60 minutes to get to Central School where the game will be played. The coach wants the team to arrive at Central School 30 minutes before the game starts. What time should the team bus leave for the game?

Answer ______________________

Justify your answer using words, drawings, or numbers.

MP5 **19.** Joel is making a small rectangular blanket. He has 360 centimeters of fringe, which is the exact amount he needs to go around the edge of the blanket. One end of the blanket is 80 cm long. What are the lengths of the other three sides?

Answer ______________________

Show your work.

MP2 **20.** The supermarket sells 1 quart of milk for \$1.89 or $\frac{1}{2}$ gallon for \$3.00. Which is the better buy?

Answer ______________________

Justify your answer using words, drawings, or numbers.

Progress Check

UNIT 5

Look at how the Common Core standards you have learned and will learn connect.

It is very important for you to understand the standards from the prior grade level so that you will be able to develop an understanding of geometry in this unit and be prepared for next year. To practice your skills, go to sadlierconnect.com.

GRADE 3		GRADE 4		GRADE 5
I Can...	**Before Unit 5**	**Can I ?**	**After Unit 5**	**I Will...**
	☐	**4.G.1** Draw points, lines, line segments, and rays	☐	**5.G.1** Understand the concept and representation of the coordinate plane
	☐	Draw right angles, acute angles, and obtuse angles	☐	
	☐	Draw parallel and perpendicular lines	☐	
	☐	Identify lines and angles in two-dimensional figures.	☐	
3.G.1 Explain that shapes in different categories may share attributes; for example, rectangles and squares both have four straight sides Classify quadrilaterals by their attributes	☐	**4.G.2** Classify shapes by properties of their lines and angles	☐	**5.G.3** Understand relationships among categories of figures; for example, all rectangles have four right angles and squares are rectangles, so all squares have four right angles **5.G.4** Classify two-dimensional figures [in a hierarchy] based on properties
	☐	Recognize right triangles as a category	☐	
	☐	**4.G.3** Identify and draw lines of symmetry	☐	
	☐	Identify figures that have line symmetry	☐	

HOME ✦ CONNECT...

Your child will use the language of geometry to analyze and classify angles and geometric figures. Support your child by using the following Math vocabulary:

- An **angle** is formed when two **rays** share the same endpoint, called the **vertex**.
- A **straight angle** forms a straight line. It measures 180°.
- A **right angle** measures 90° and is formed by the intersection of two perpendicular lines.
- An **acute angle** is less than a right angle, or measures between 0° and 90°.
- An **obtuse angle** is more than a right angle, or measures between 90° and 180°.

Activity: Plan a shape scavenger hunt for your child and some friends or siblings. Make a list of two-dimensional figures (such as right triangle, parallelogram, rectangle, pentagon), and ask the children to safely search around your home or other safe locale to find examples of each figure.

In this unit your child will:

- Draw and identify points, lines, and angles.
- Classify two-dimensional figures.
- Identify lines of symmetry.

NOTE: All of these learning goals for your child are based on the Grade 4 Common Core State Standards for Mathematics.

Ways to Help Your Child

Encourage your child to share math vocabulary words and their meanings with your family. Using the mathematical vocabulary will help your child to make connections, as well as to avoid misconceptions.

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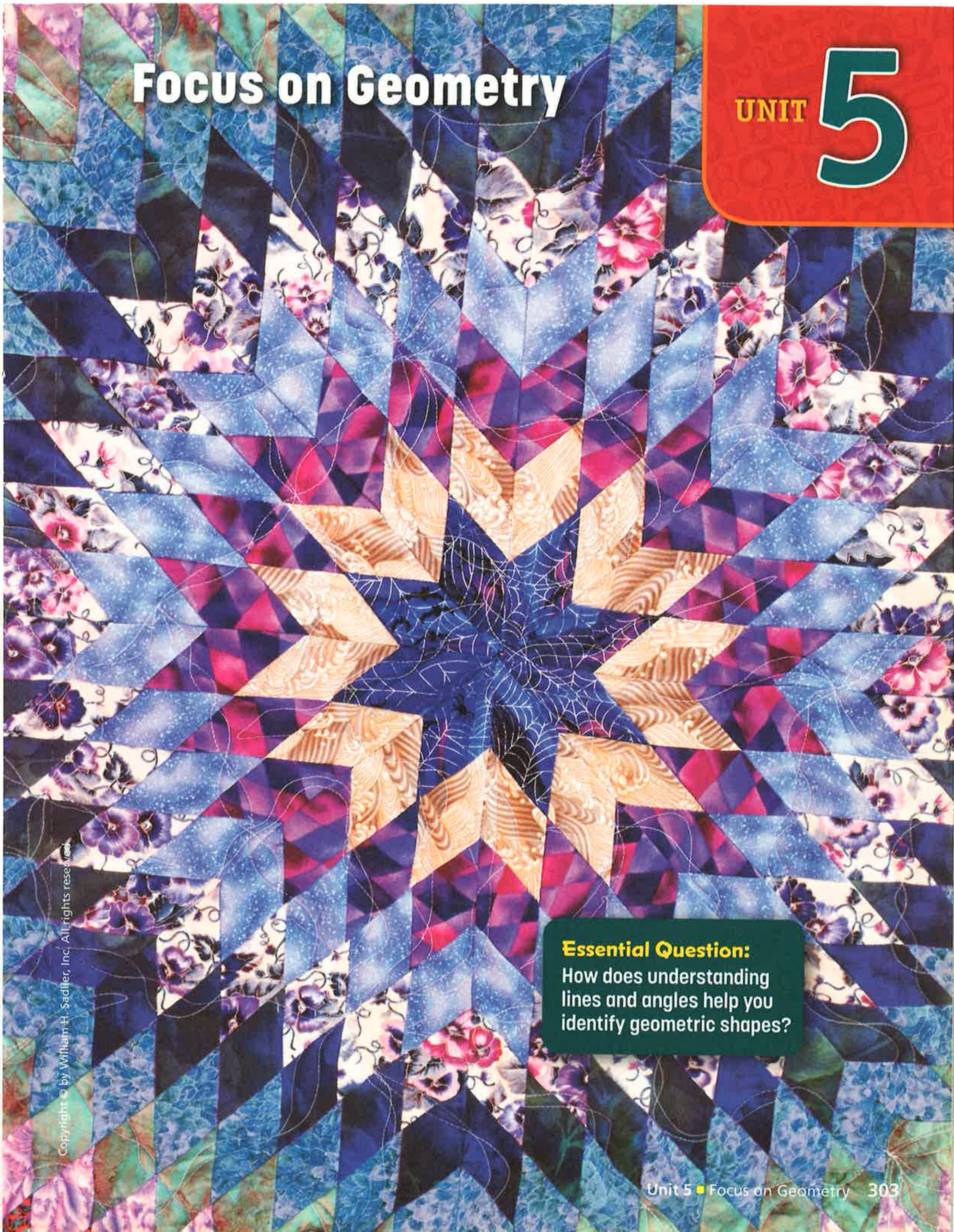
Focus on Geometry

UNIT 5



Essential Question:
How does understanding lines and angles help you identify geometric shapes?

Lesson

34 Draw and Identify Points, Lines, and Angles

Guided Instruction

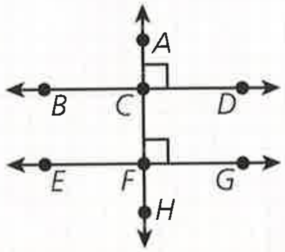
Essential Question:
How do you draw and identify points, lines, and angles in geometric figures?
4.G.1

Words to Know:
- line
- line segment
- parallel lines
- perpendicular lines

In this lesson you will learn how to use the language of geometry to analyze and classify geometric figures.

Understand: Using and applying geometric terms

Using this geometric figure, what geometric terms can you define?



You learned that a point is an exact location in space. Points are named using capital letters. On this figure, points A through H identify locations.

A line is an endless collection of points along a straight path. To name a line, use any two points on the line. Look at lines AH, BD, and EG. Each line can also be named by any other two points on the line, for example, CF or FH also name line AH.

A line segment is part of a line that has two endpoints. Using the endpoints you can name line segments AH, BD, and EG. Some other line segments are line segments AC, BC, and CF.

A ray is a part of a line that has one endpoint and extends endlessly in the other direction. To name a ray, start with the endpoint and use any other point on the ray. For example, ray AC is the same ray as ray AF or ray AH since it starts at point A and extends endlessly along line AH. Some other rays are rays CB, CA, and CD.

Parallel lines are lines that will never meet, or intersect. Line BD is parallel to line EG.

Perpendicular lines are lines that meet, or intersect, to form a right angle. When you see a square in the corner it shows that a right angle is formed and thus the lines are perpendicular. Line AH is perpendicular to line BD. Line AH is also perpendicular to line EG.

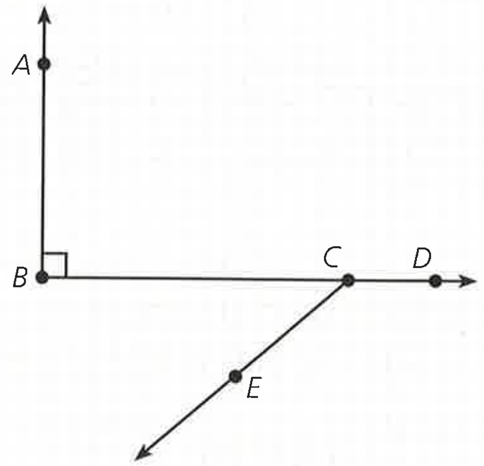
Remember!
A right angle forms a square corner.

➡ You have defined points, lines, line segments, rays, parallel lines, and perpendicular lines.

Guided Instruction

Understand: Identifying right, acute, obtuse, and straight angles

Identify the types of angles that are shown here.



Remember!
An angle is formed when two rays share the same endpoint, called the vertex. The two rays form the sides of the angle.

An angle is named by its vertex, the point from which the two sides of an angle begin. The angle at *B* is marked by the symbol (⌝) so it is a right angle and measures 90°. It can also be named as angle *ABC*, or angle *CBA*. The letter naming the vertex names the angle. In a three letter angle name, the vertex is the middle letter.

An angle that is less than a right angle is an acute angle. It measures less than 90°. Angle *BCE* is an acute angle.

An angle that is greater than a right angle is an obtuse angle. It measures more than 90° and less than 180°. Angle *DCE* is an obtuse angle.

An angle that forms a straight line is a straight angle. It measures 180°. Angle *BCD* is a straight angle.

➡ Angle *ABC* is a right angle, angle *BCE* is an acute angle, angle *DCE* is an obtuse angle, and angle *BCD* is a straight angle.

How can you check that angles *BCE* and *DCE* are not right angles?

Guided Instruction

Connect: What you know about the language of geometry and geometric shapes

Pablo cuts a piece of blue glass to make a triangle that will be placed in a stained glass window. The triangle has one obtuse angle. Show what the triangle with one obtuse angle might look like.

Step 1

Understand what it means for an angle to be obtuse.

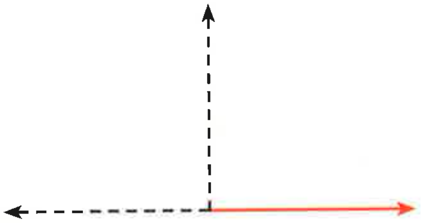
You know that it cannot be a right angle or measure 90°.

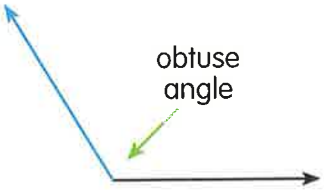
An obtuse angle must be __________ than a right angle but
greater or less

__________ than a straight angle.
greater or less

Step 2

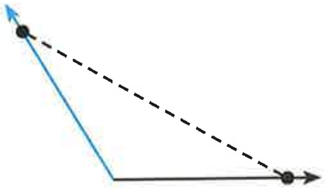
Now draw an obtuse angle: from the same vertex point draw one horizontal ray and then another ray that is between the two rays representing 90° and 180°.

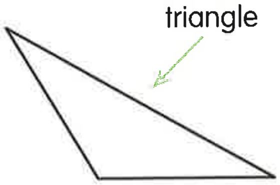




Step 3

Choose one point on each ray and connect the points to form a triangle with on obtuse angle.





▶ The triangle above is a triangle with one __________ angle.

Name another angle or angles that you see in the triangle formed in Step 3.

Guided Practice

For exercises 1–4, draw and label an example.

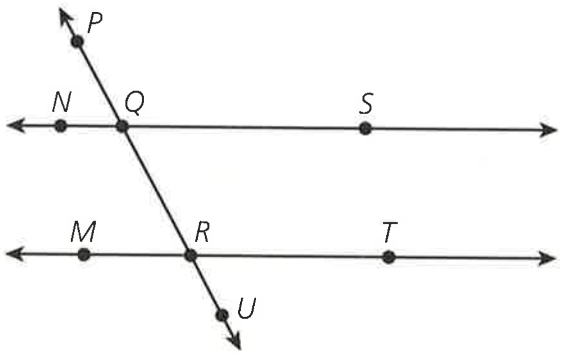
1. line *JK*

2. line segment *QR*

3. acute angle *CDE*

4. line *LM* parallel to line *ST*

For exercises 5–9, use the figure at the right.



5. Name three line segments.

____

6. Name two rays.

____

7. Name an obtuse angle.

____

8. Name an acute angle.

____

Solve the problem.

MP7 **9.** On a blueprint, a designer used two right angles to make a straight angle. Draw an example to show how two right angles can make a straight angle.

Think•Pair•Share

MP3 **10.** Describe something in your classroom that reminds you of parallel lines. Explain why you think the lines are parallel.

Independent Practice

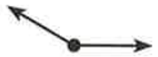
For exercises 1–10, draw and label an example.

1. ray *CD*
2. line *XY*
3. right angle *JKL*
4. line segment *AB*
5. line *EF* perpendicular to line *GH*
6. acute angle *PQR*
7. obtuse angle *DEF*
8. line *QR* parallel to line *ST*
9. straight angle *LMN*
10. line *AB* perpendicular to line segment *CD*

Independent Practice

Classify each angle as acute, right, obtuse, or straight.

11.



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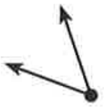

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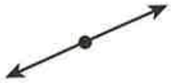

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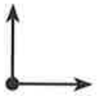

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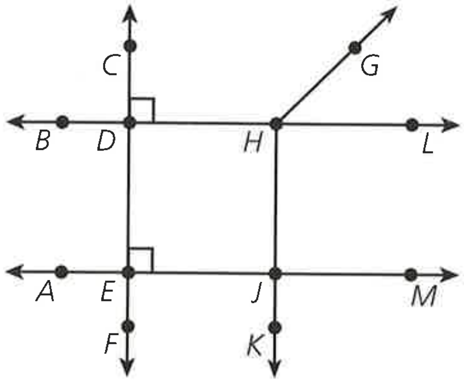
For exercises 15–23, use the figure.



15. Name five points. ______________________

16. Name four line segments. ______________________

17. Name three lines. ______________________

18. Name four rays. ______________________

19. Line segments *DE* and *HJ* have the same length. Name a pair of parallel lines. ______________________

20. Name a pair of perpendicular lines. ______________________

21. Name a straight angle. ______________________

22. Name an obtuse angle. ______________________

23. Name an acute angle. ______________________

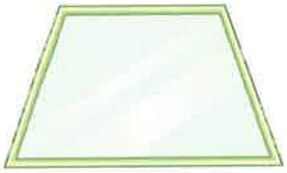
Independent Practice

24. Draw a triangle with one right angle.

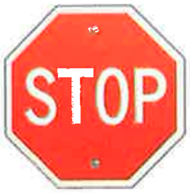
Classify the other two angles in your triangle as acute, right, obtuse, or straight. Explain how you classified the other two angles.

Solve the problems.

MP6 **25.** The window above a door is in the shape shown at the right. How many acute, obtuse, and right angles are in the window? Do any of the pairs of line segments used in the shape of the window look parallel or perpendicular?



MP4 **26.** Look at the stop sign at the right. How many acute, obtuse, and right angles are in the stop sign? Do any of the pairs of line segments used in the shape of the stop sign look parallel or perpendicular?



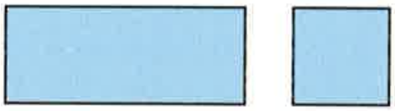
Independent Practice

MP4 **27.** The street my friend Craig lives on is parallel to the street Francie lives on. The street Francie lives on is parallel to the street Briana lives on. The street Briana lives on is parallel to the street Drew lives on. Describe the relationship between Craig's street and Drew's street.

Answer ____________________

Justify your answer using words, drawings, or numbers.

MP7 **28.** Taylor has two tiles shaped like the rectangle and the square shown below. She notices that some geometric characteristics of the tiles are the same and some are different.



What is something the same that Taylor might notice? What is something different?

Answer ____________________

Justify your answer using words, drawings, or numbers.

MP6 **29.** Travis draws a pair of lines on a sheet of paper. The lines he draws do not intersect. What can you say about the lines? Are they necessarily parallel, perpendicular, or neither? Explain.

Answer ____________________

Justify your answer using words, drawings, or numbers.

Lesson

35 Classify Two-Dimensional Figures

Essential Question:
How do you classify two-dimensional figures?
4.G.2

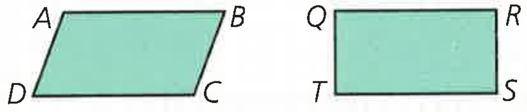
Words to Know:
- **parallelogram**
- **adjacent**
- **rectangle**
- **trapezoid**
- **right triangle**
- **pentagon**
- **hexagon**

Guided Instruction

In this lesson you will learn how to classify two-dimensional figures using angle measures and pairs of parallel or perpendicular sides.

Understand: Using parallel or perpendicular lines to classify two-dimensional figures

Dawn makes dog collars. She stamps the collars with two-dimensional figures to create decorative patterns. Two of the figures she uses are shown. Classify or identify by attributes the figures that Dawn uses to create the decorative patterns.



The figures that Dawn uses are quadrilaterals.

You can use parallel lines and perpendicular lines to further classify the quadrilaterals.

Remember!
Parallel lines never meet and are always the same distance apart. Perpendicular lines meet at right angles.

Parallel sides are sides that are parts of parallel lines. In quadrilateral $ABCD$, side AB is parallel to side DC. Side AD is parallel to side BC. Both pairs of opposite sides are parallel. So quadrilateral $ABCD$ is a parallelogram. In quadrilateral $QRST$, side QR is parallel to side TS. Side QT is parallel to side RS. Both pairs of opposite sides of the quadrilateral are parallel. Quadrilateral $QRST$ is also a parallelogram.

Perpendicular sides are sides that are adjacent, or next to each other, and are parts of perpendicular lines. In parallelogram $QRST$, side QT is perpendicular to side TS. Side RS is perpendicular to side TS. A parallelogram with two pairs of perpendicular sides is a rectangle. So quadrilateral $QRST$ can also be classified as a rectangle.

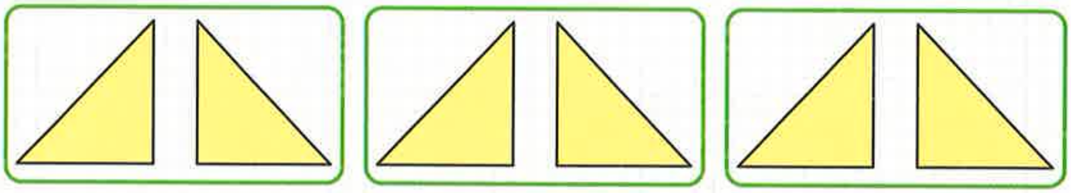
➧ Dawn uses parallelograms and rectangles to create the decorative patterns.

You learned that a parallelogram with all sides of equal length can be classified as a rhombus. There is another kind of quadrilateral that has at least one set of parallel sides. It is a trapezoid.

Guided Instruction

Understand: Using angle measurement to classify two-dimensional figures

Dawn creates another pattern by stamping the same pair of two-dimensional figures several times. Classify the two-dimensional figures Dawn uses to create this new pattern for her dog collars.



Each triangle has one pair of perpendicular sides.
The perpendicular sides meet at right angles.

Each triangle has exactly one right angle.
Notice that the other two angles in the triangle measure less than 90°, so they are acute angles.
A triangle with one right angle is called a right triangle.

Remember!
A right angle measures 90° and forms a square corner.

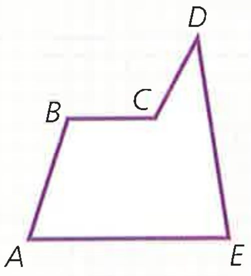
Dawn uses right triangles to create the new pattern for her dog collars.

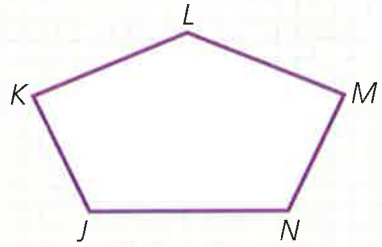
Draw an example of a triangle that is not a right triangle.
How do you know it is not a right triangle?

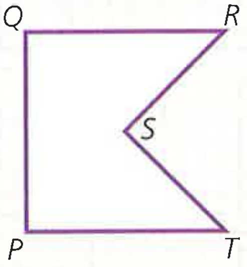
Guided Instruction

Connect: What you know about classifying two-dimensional figures

Identify the polygons. Then identify any pairs of parallel or perpendicular sides.







Each of the polygons is a pentagon.

A pentagon has ____ straight sides and ____ angles.

Do any pairs of sides of pentagon *ABCDE* form right angles? ______

Are any pairs of sides of pentagon *ABCDE* perpendicular? ______
In pentagon *ABCDE* side *AE* and side *BC* are always the same distance apart.

If the sides were extended, would the lines ever meet? ______

Are any pairs of sides of pentagon *ABCDE* parallel? ______

Which sides of pentagon *ABCDE* are parallel? ____________________

Do any pairs of sides of pentagon *JKLMN* form right angles? ______

Are any pairs of sides of pentagon *JKLMN* parallel? ______

Do any pairs of sides of pentagon *PQRST* form right angles? ______
Which pairs of sides of pentagon *PQRST* are perpendicular?

____

Are any pairs of sides of pentagon *PQRST* parallel? ______

Which sides of pentagon *PQRST* are parallel? ____________________

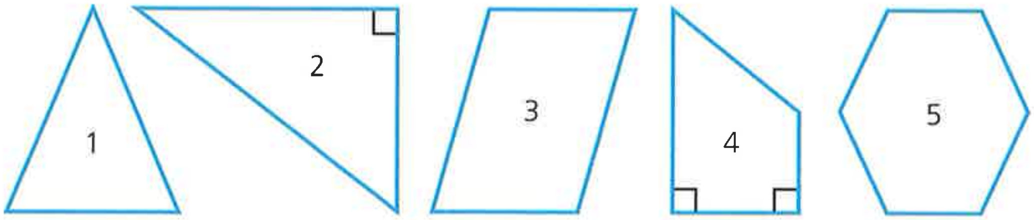
➡ Polygons ____________________ each have one pair of parallel sides

and polygon ____________________ has two pairs of perpendicular sides.

A hexagon is a polygon with 6 sides and 6 angles.

Guided Practice

For questions 1–7, use polygons 1–5.



1. Which of the polygons have no right angles? ________

2. Which of the polygons have at least one pair of perpendicular sides?

____

3. Which of the polygons seem to have at least one pair of parallel sides?

____

4. Which of the polygons is a right triangle? ________

5. Which of the polygons are quadrilateral? ________

6. What is another way to classify each quadrilateral?

____

7. Classify polygon 5. ________

Solve the problem.

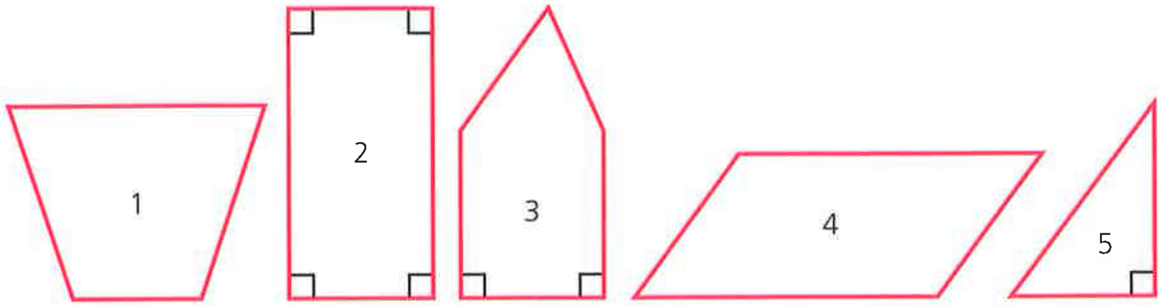
MP6 **8.** Julia says that she can draw a right triangle in which two sides have the same length. Is Julia correct? Draw an example to justify your answer.

Think•Pair•Share

MP5 **9.** Draw a hexagon with exactly two right angles. Explain how you drew the hexagon. Does your hexagon have any pairs of parallel or perpendicular sides?

Independent Practice

For questions 1–8, use polygons 1–5.



1. Which of the polygons have no right angles? __________

2. Which of the polygons have at least one pair of perpendicular sides?

____

3. Which of the polygons seem to have at least one pair of parallel sides?

____

4. Which of the polygons is a right triangle? __________

5. Which of the polygons are quadrilaterals? __________

6. Classify the quadrilaterals.

____

7. Classify polygon 3. __________

MP7 **8.** Choose two of the polygons. Tell how they are alike. Then tell how they are different.

Independent Practice

For exercises 9–15, draw an example of each. Then classify the polygon you drew.

9. A triangle with a pair of perpendicular sides ________

10. A polygon with 3 sides and no right angles ________

11. A rhombus with at least one right angle ________

12. A parallelogram with at least one pair of perpendicular sides ________

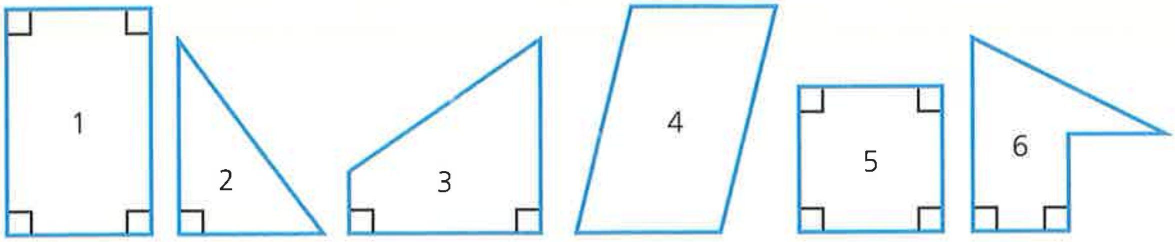
13. A quadrilateral with no right angles and at least one pair of opposite sides that are parallel ________

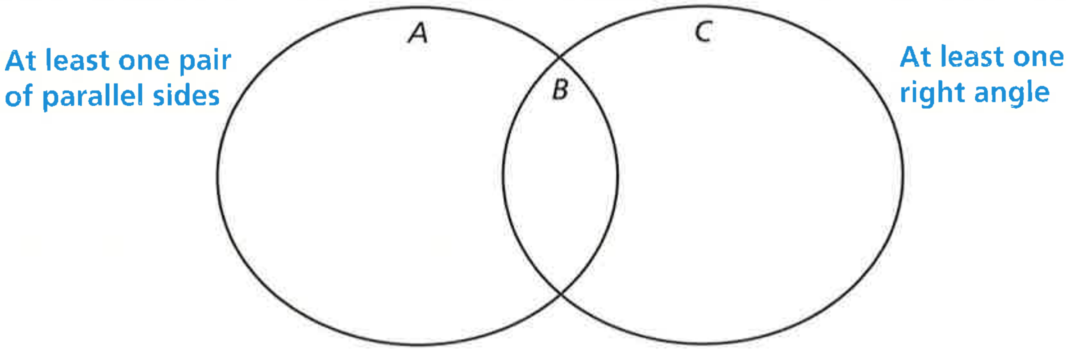
14. A polygon with 5 sides, one pair of parallel sides, and at least one pair of perpendicular sides ________

15. A polygon with 6 sides and two pairs of parallel sides ________

Independent Practice

For exercises 16–20, use polygons 1–6 and the Venn diagram.




At least one pair of parallel sides
At least one right angle
A
B
C

16. Write the numbers of the polygons in the correct parts of the Venn diagram (A, B, or C).

17. In which part did you place polygon 2 in the Venn diagram? Explain why.

18. In which part did you place polygon 3 in the Venn diagram? Explain why.

19. In which part did you place polygon 4 in the Venn diagram? Explain why.

MP3 **20.** Explain why you placed some of the polygons in the overlapping part of the diagram.

Independent Practice

MP7 **21.** Xavier says that he can draw a parallelogram with exactly one right angle. Is Xavier correct? If the statement is incorrect, how can you change it to make it correct?

Answer ____

Justify your answer using words, drawings, or numbers.

MP8 **22.** Antoine says that every square is a rhombus. Is Antoine correct? If the statement is incorrect, how can you change it to make it correct?

Answer ____

Justify your answer using words, drawings, or numbers.

MP3 **23.** Marisol says that every quadrilateral must be a parallelogram or a trapezoid. Is Marisol correct? If the statement is incorrect, how can you change it to make it correct?

Answer ____

Justify your answer using words, drawings, or numbers.

Lesson

36 Identify Lines of Symmetry

Essential Question:
How do you identify and draw lines of symmetry?
4.G.3

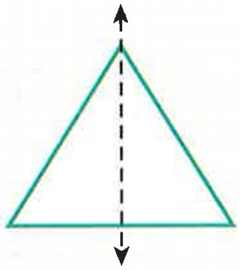
Words to Know:
line of symmetry

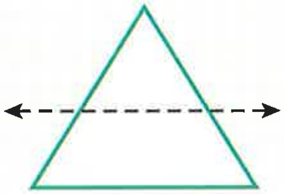
Guided Instruction

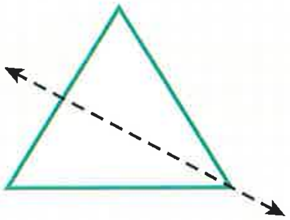
In this lesson you will learn how to recognize and draw lines of symmetry for a two-dimensional figure.

Understand: Identifying lines of symmetry

Theresa has a triangular piece of paper that she wants to fold so that the two parts will match. Which drawings show ways that Theresa can fold the triangular piece of paper so that the two parts match exactly?


Drawing 1


Drawing 2


Drawing 3

A two-dimensional figure has line symmetry if it can be folded along a line so that the two parts match exactly.
The line that represents the fold is called a line of symmetry. A two-dimensional figure can have one or more lines of symmetry. It can also have no lines of symmetry.

The dashed lines show different ways Theresa can fold the triangle. She must decide which of the dashed lines are lines of symmetry.

If Theresa folds the triangle along the dashed line shown in Drawing 1, both parts will match up exactly. The dashed line in Drawing 1 is a line of symmetry.

If Theresa folds the triangle along the dashed line shown in Drawing 2, both parts will not match up exactly. The dashed line in Drawing 2 is not a line of symmetry for the triangle.

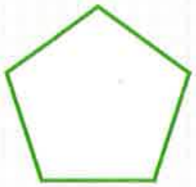
If Theresa folds the triangle along the dashed line shown in Drawing 3, both parts will match up exactly. The dashed line in Drawing 3 is a line of symmetry.

➡ The two parts will match exactly if Theresa folds the triangular piece of paper along either of the lines of symmetry shown in Drawings 1 and 3.

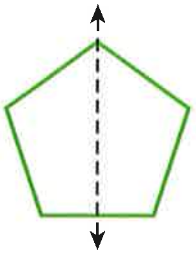
Guided Instruction

Understand: Drawing lines of symmetry

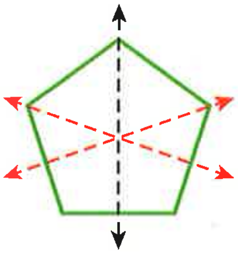
Eric draws a pentagon. Each side of the pentagon is the same length. He wants to find all the lines of symmetry of the pentagon. How many lines of symmetry does his pentagon have?



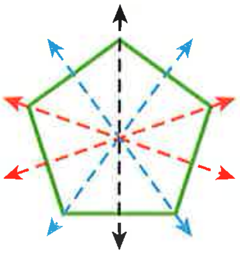
To draw a line of symmetry, decide where to fold the figure so that the parts match up exactly. If the pentagon is folded along the line from the top vertex to the center of the opposite side of the pentagon, the parts will fold over one another exactly. The dashed line shows a line of symmetry.



All of the sides of this pentagon are the same length. If the figure is folded along the line from any vertex to the middle of the opposite side, the parts will match. The drawing shows two more lines of symmetry.



You can draw two more lines in the same way. Each line of symmetry goes through one of the vertices to the center of the opposite side. The drawing shows all the lines of symmetry of the pentagon.



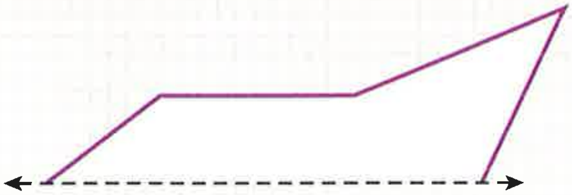
The pentagon that Eric draws has five lines of symmetry.

Will every pentagon have five lines of symmetry? Explain your thinking. Draw a diagram to support your answer.

Guided Instruction

Connect: What you know about lines of symmetry

Isabel is creating a design for a poster. The dashed line is a line of symmetry for the design. Draw the other half of Isabel's design.



Step 1

The dashed line is a line of symmetry. When the top part of the design is folded over the line of symmetry, the bottom part will match it exactly. This means the part below the line is a mirror image of the part above the line.

There are 4 line segments above the line of symmetry. How many line segments will be in the other half of Isabel's design?

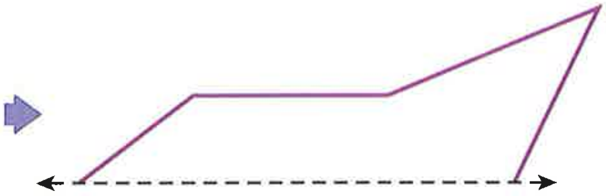
______

Step 2

Draw the part of the design that will be below the line of symmetry.

Start with the leftmost line segment. Below the line of symmetry draw a line segment that looks like a mirror image of that line segment.

Continue to draw the line segments in order from left to right.

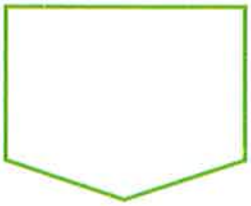


If you fold your completed design along the line of symmetry the parts match up.

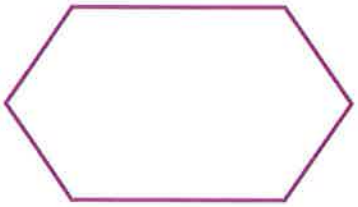
Guided Practice

Draw all the lines of symmetry for each figure.

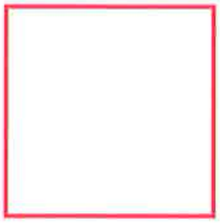
1.



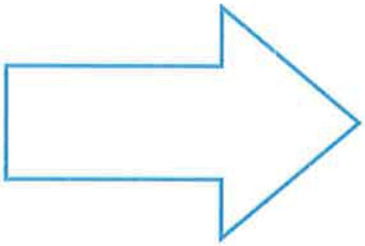
2.



3.

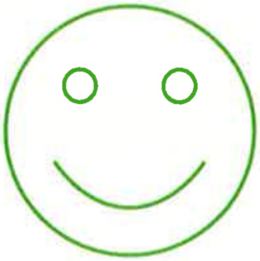


4.



Solve the problem.

MP1 **5.** Blake designs a circular invitation that shows a happy face when it is opened. Draw the line of symmetry along which Blake folds his invitation.



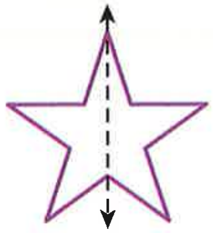
Think • Pair • Share

MP5 **6.** Use the dashed line below as a line of symmetry. Draw three sides of a polygon above this line of symmetry. Then draw the other half of the polygon below the line of symmetry. Explain why the completed polygon has line symmetry.

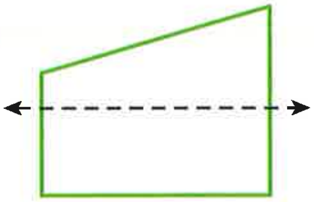
Independent Practice

Is the dashed line on each figure a line of symmetry? Write *Yes* or *No*.

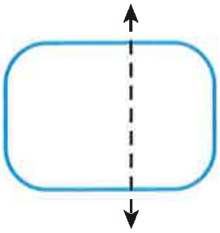
1.



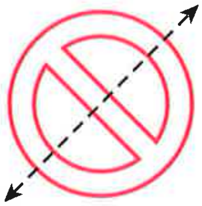
2.



3.

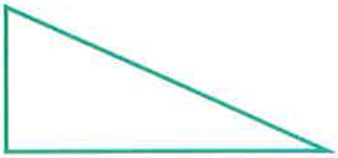


4.

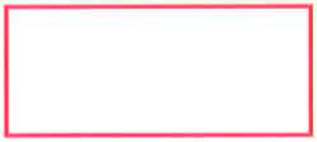


Does the figure have line symmetry? If Yes, draw the line or lines of symmetry. If No, write *No*.

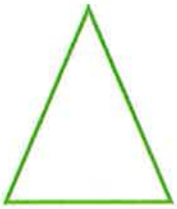
5.



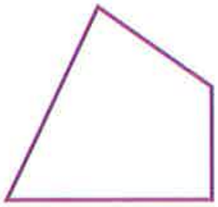
6.



7.



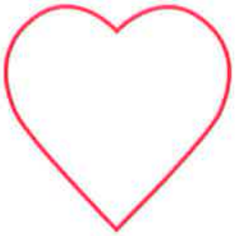
8.



Independent Practice

Draw all the lines of symmetry for each figure.

9.



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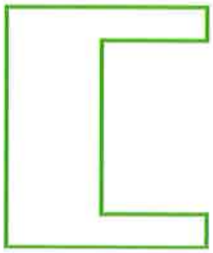
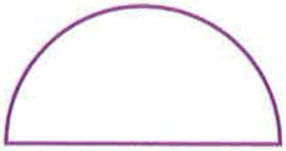
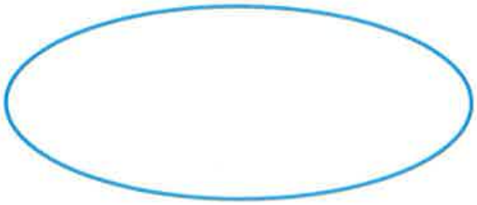


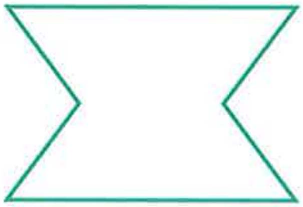
11.



12.



13.



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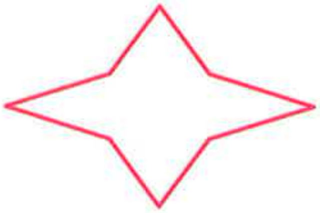

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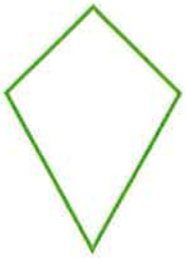
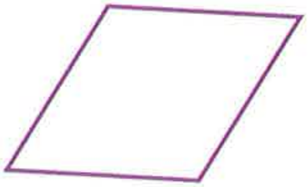
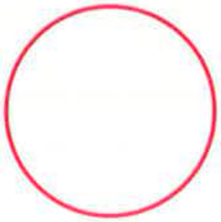


16.



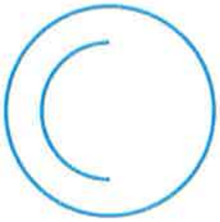
Independent Practice

17. Look at the circle. Does a circle have line symmetry? If so, how many lines of symmetry does a circle have? Explain your answer.

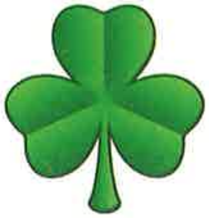


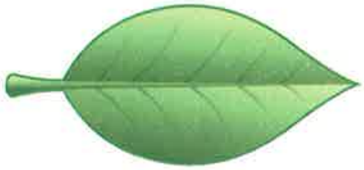
Solve the problems.

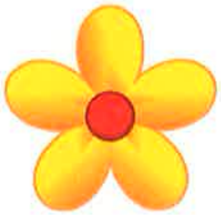
MP5 **18.** The logo for Zany's company is shown at the right. Does the logo have a line of symmetry? If so draw the line of symmetry.



MP4 **19.** Alev drew these pictures of a shamrock, a leaf, and a flower that she saw while hiking. Do any of the shapes have line symmetry? If so, draw at least one line of symmetry on each shape.

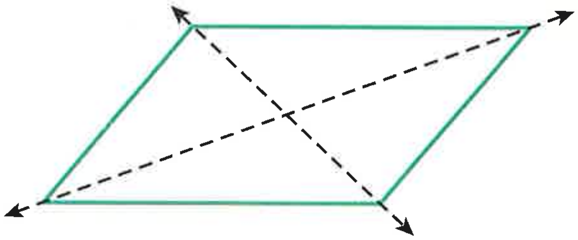






Independent Practice

MP3 **20.** Jake says that the lines shown are lines of symmetry for the parallelogram. Is Jake correct?



Answer ______________________________

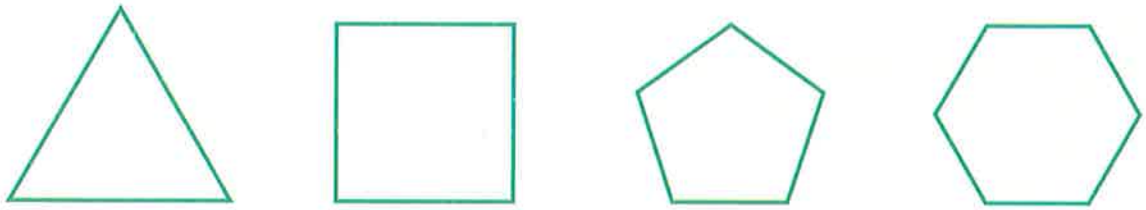
Justify your answer using words, drawings, or numbers.

MP7 **21.** Think of the capital letters of the alphabet. Name three letters that do not have a line of symmetry. Name three letters that have exactly one line of symmetry. Name three letters that have more than one line of symmetry.

Answer ______________________________

Justify your answer using words, drawings, or numbers.

MP8 **22.** Each of the polygons below has sides that are the same length. Describe the pattern between the number of sides and the number of lines of symmetry for each figure. Use the pattern to predict the number of lines of symmetry for a polygon with 10 sides of equal length.



Answer ______________________________

Justify your answer using words, drawings, or numbers.

UNIT 5 Common Core Review

Draw and label an example of each of the following.

1. line segment *AB*

2. line *CD* perpendicular to line *EF*

3. acute angle *GHI*

4. obtuse angle *JKL*

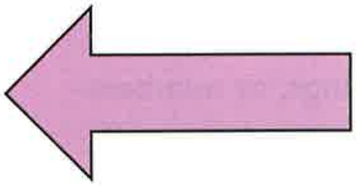
5. line *MN* parallel to line *OP*

6. ray *QR*

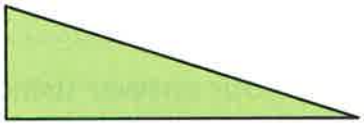
Circle the correct answer.

7. Which figure has a line of symmetry?

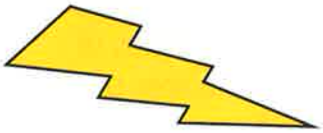
a.



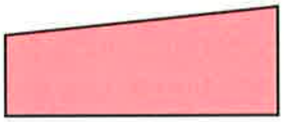
b.



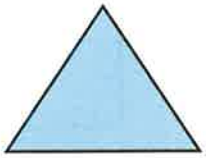
c.



d.



8. This triangle has all sides the same length. How many lines of symmetry does it have?

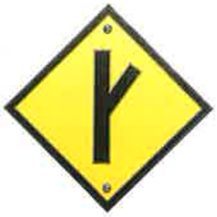


a. 0
b. 1
c. 2
d. 3

9. Draw a right triangle. Explain why your triangle is a right triangle.

UNIT 5 Common Core Review

10. What three kinds of angles can you find in the traffic sign? Label them.



For exercises 11–14, draw an example of each. Then classify the polygon you drew.

11. A polygon with 6 sides and 6 angles

____

12. A triangle with a right angle

____

13. A quadrilateral with at least one pair of parallel sides

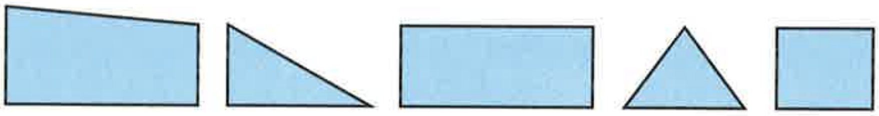
____

14. A parallelogram with 4 right angles and all sides the same length

____

For exercises 15 and 16, one shape does not belong. Circle it. Tell why the shape does not belong.

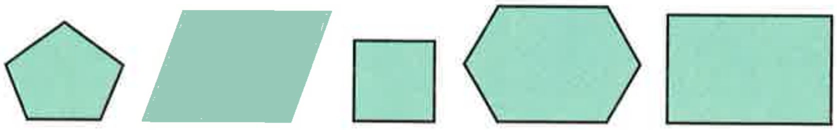
MP7 **15.**



The shape I circled does not belong because

____

MP7 **16.**



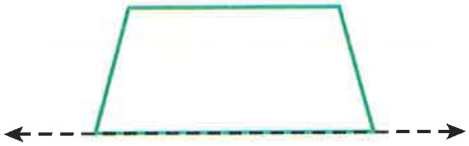
The shape I circled does not belong because

____

UNIT 5 Common Core Review

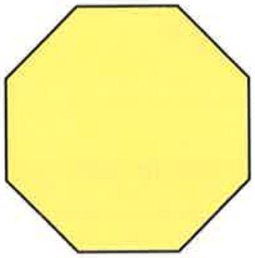
Solve the problems.

MP6 **17.** The dashed line is a line of symmetry. Draw the other half of the shape to make a symmetrical figure. What shape did you make?



Answer __________________________________

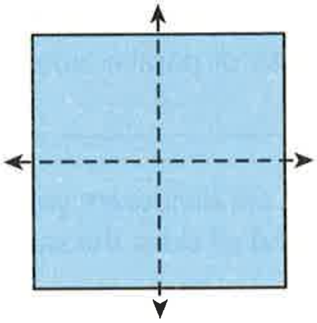
MP4 **18.** A bathroom tile is in the shape shown at the right. What kind of angles does the tile have—acute, right, or obtuse? Does the tile have any pairs of parallel or perpendicular sides?



Answer __________________________________

____

MP3 **19.** Autumn drew the figure at the right to prove that a square has only 2 lines of symmetry. Is Autumn correct?



Answer __________________________________

Justify your answer using words, drawings, or numbers.

MP6 **20.** Dominic says that every rhombus is a square. Is Dominic correct?

Answer ____

Justify your answer using words, drawings, or numbers.

Performance Task 2

4.OA.4, 4.NF.1, 4.NF.3a, 4.MD.1, 4.MD.2, 4.MD.3, 4.MD.4, 4.MD.6, 4.MD.7, 4.G.1, 4.G.2, 4.G.3

Performance Tasks

Performance Tasks show your understanding of the Math that you have learned. You will be doing various Performance Tasks as you complete your work in this text.

Beginning This Task

The next five pages provide you with the beginning of a Performance Task. You will be given 5 items to complete, and each item will have two or more parts. As you complete these items you will:

I Demonstrate that you have mastered mathematical skills and concepts

II Reason through a problem to a solution, and explain your reasoning

III Use models and apply them to real-world situations.

Extending This Task

Your teacher may extend this Performance Task with additional items provided in our online resources at sadlierconnect.com.

Scoring This Task

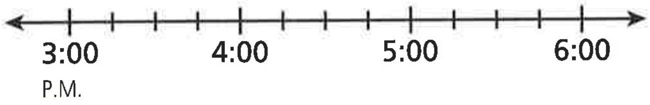
Your response to each item will be assessed against a rubric, or scoring guide. Some items will be worth 1 or 2 points, and others will be worth more. In each item you will show your work or explain your reasoning.

Performance Task 2

Building a Neighborhood Playground

1. The children and adults who live in Dan's neighborhood are building a playground. A team of children works together to tear down an old fence and take the boards away to a recycling bin.

a. The team begins work at 3:30 P.M. Draw a point on the number line to show 3:30 P.M.



b. The team spends $\frac{3}{4}$ hour tearing down the fence. What time does the team finish tearing down the fence? Show how to use the number line above to find what time the team finishes the task.

c. Next, the team works $1\frac{1}{2}$ hours taking away the boards to a recycling bin. What time does the team finish taking away the boards? Show how to use the number line above to find what time the team finishes this task.

d. How many minutes does the team spend altogether on the two tasks? Explain the method you used to find your answer.

Performance Task 2

A Lawn Area at the Playground

2. Rhonda is planning a lawn for a playground. The lawn will be a rectangle with an area of 60 square meters. The length of each side will be a whole number of meters.

a. Explain how Rhonda can find possible side lengths for the lawn.

b. Find all possible pairs of side lengths for the lawn.

c. How do you know that you found all possible pairs of side lengths?

d. Find the side lengths for the lawn that would have the least perimeter. What is the least perimeter? Explain your reasoning.

Performance Task 2

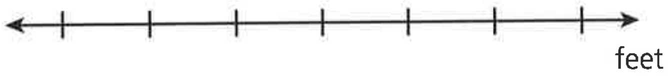
Future Shade

3. A tree nursery donates some trees for a new playground. Carlos and Nikki measure the heights of the trees and record the data.

a. Use their data to make a line plot.

Heights of Trees (ft)

$1\frac{2}{4}$	$1\frac{3}{4}$	$2\frac{1}{4}$	2	$1\frac{3}{4}$
$2\frac{2}{4}$	2	$2\frac{3}{4}$	$1\frac{2}{4}$	$2\frac{1}{4}$
$1\frac{3}{4}$	$2\frac{1}{4}$	$1\frac{1}{4}$	$2\frac{2}{4}$	$1\frac{3}{4}$



b. Which Xs on the line plot represent trees that are $2\frac{1}{2}$ feet tall?

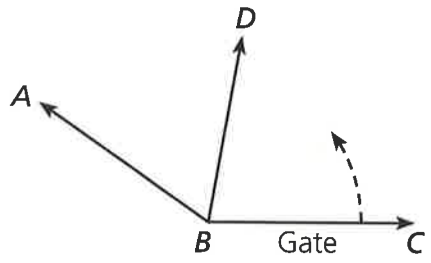
c. How many inches tall is a tree that is 2 feet tall?

d. What is the difference in height between the tallest tree and the shortest tree? Use the line plot.

Performance Task 2

A Gate for the Playground

4. Bernard works on a gate for a playground. The diagram shows that the gate should open to $\angle ABC$, but it only opens to $\angle DBC$.



a. Use a protractor. Find the measure of $\angle ABC$ and the measure of $\angle DBC$.

b. Explain two ways to find the measure of $\angle ABD$.

c. Find the measure of $\angle ABD$ using both of your methods.

d. Which method do you prefer? Explain.

Performance Task 2

A Playground Game

5. Pedro and Derron are designing a playground game.

a. Pedro begins by drawing a rectangle that is not a square. Draw a rectangle that could be Pedro's.

b. Is the figure you drew a parallelogram? Explain.

c. Next Pedro draws two line segments inside the rectangle. The line segments are perpendicular and are parts of two lines of symmetry of the rectangle. Draw those two line segments in your rectangle.

d. Derron says that Pedro can draw two more line segments that are also parts of lines of symmetry of the rectangle. Is Derron correct? Explain why or why not.

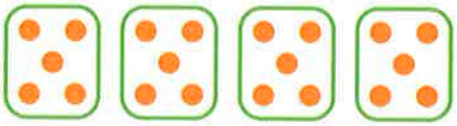
Foundational Skills Handbook

A review of prerequisite mathematics needed to understand the concepts and skills of Grade 4.

A. Understand: The meaning of a product

A product is the result of multiplication.

The product of 4 × 5 is 20.



4 cards
5 dots on each card
4 fives equals 20.

$$\text{factors} \longrightarrow 4 \times 5 = 20 \longleftarrow \text{product}$$

B. Understand: Use multiplication to solve division

You can use related multiplication facts to solve division problems.

Knowing the fact family can help.

$$\underset{\substack{\uparrow \\ \text{number} \\ \text{in all}}}{16} \quad \div \quad \underset{\substack{\uparrow \\ \text{number in} \\ \text{each group}}}{2} \quad = \quad \underset{\substack{\uparrow \\ \text{number of} \\ \text{groups}}}{■}$$

Think: What number times 2 makes 16?

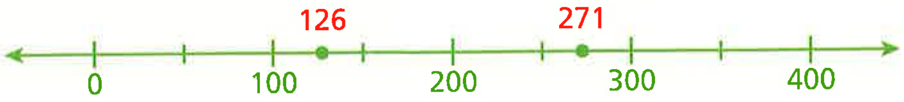
$$\underset{\substack{\uparrow \\ \text{number of} \\ \text{groups}}}{■} \quad \times \quad \underset{\substack{\uparrow \\ \text{number in} \\ \text{each group}}}{2} \quad = \quad \underset{\substack{\uparrow \\ \text{number} \\ \text{in all}}}{16}$$

Use the fact family for 2, 8, and 16 to help solve the problem.
2 × 8 = 16 16 ÷ 8 = 2
8 × 2 = 16 16 ÷ 2 = 8

Find the unknown factor in the multiplication: ■ × 2 = 16
Use the unknown factor to complete the related division: 16 ÷ 2 = 8

C. Understand: Round numbers to the nearest hundred

You can use a number line to round numbers to the nearest hundred.



Round 126 to the nearest hundred.
126 is closer to 100 than 200.
126 rounds to 100.

Round 271 to the nearest hundred.
271 is closer to 300 than to 200.
271 rounds to 300.

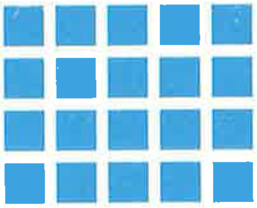
You can also use these rules to round three-digit numbers.
If the tens digit is 1, 2, 3, or 4, round to the lesser 100.
If the tens digit is 5 or greater, round to the greater 100.

Round 325 using the rules.
325 is between 300 and 400.
The tens digit is 2, so round to the lesser 100.
325 rounds to 300.

D. Understand: Multiplication Strategies

There are many ways to find a product. Here are two strategies you can use to find the product of 4 x 5.

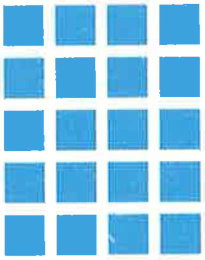
You can draw an array.



The array at the left shows 4 equal groups of 5.
You can write 4 × 5 = 20.
You can also write

$$\begin{array}{r} 4 \\ \times\ 5 \\ \hline 20 \end{array}$$

You can also use the Commutative Property.



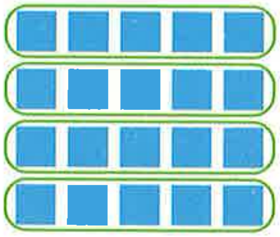
The array at the left shows that $5 \times 4 = 20$.

If you know that $5 \times 4 = 20$, then you know that $4 \times 5 = 20$.

E. **Understand:** Division Strategies

The result of a division problem is a quotient. Here are two strategies to find the quotient of 20 ÷ 5.

You can draw an array.



The array shows that 20 can be divided into 4 equal groups of 5.

You can write $20 \div 4 = 5$.

You can also write $\begin{array}{r} 5 \\ 4\overline{)20} \end{array}$

You can also use a related multiplication fact.

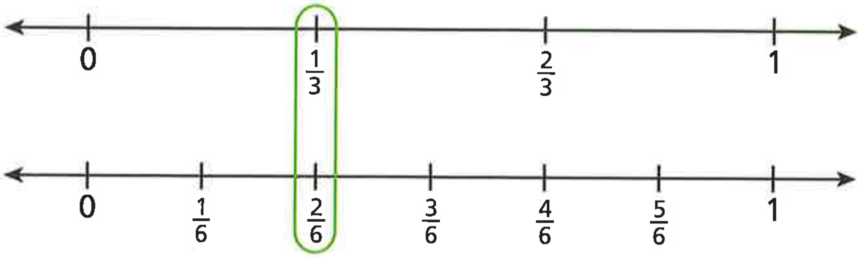
If you know that $4 \times 5 = 20$, then you know that $20 \div 5 = 4$.

F. **Understand:** Find equivalent fractions on a number line

You can use number lines to find fractions that have different names but are at the same point on the number line. These are called equivalent fractions.

How many sixths are equivalent to $\frac{1}{3}$?

Find $\frac{1}{3}$ on the number line. Find the equivalent fraction in sixths directly below it on the number line on the bottom.



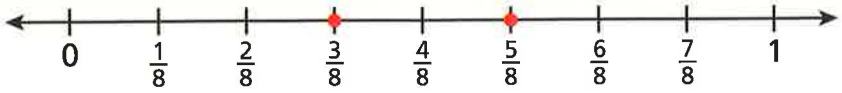
$\frac{1}{3}$ is equivalent to $\frac{2}{6}$.

$\frac{1}{3} = \frac{2}{6}$

G. Understand: Compare fractions on a number line

Compare $\frac{5}{8}$ and $\frac{3}{8}$.

Look at the number line.



Remember!
> means is greater than.
< means is less than.

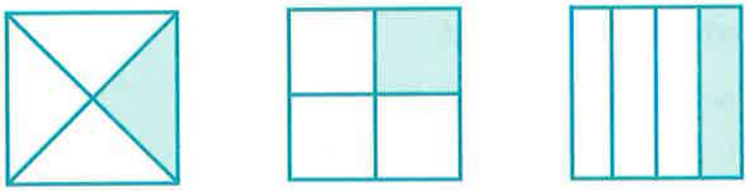
$\frac{5}{8}$ is to the right of $\frac{3}{8}$ on the number line, so $\frac{5}{8}$ is greater than $\frac{3}{8}$.

To show this comparison, write $\frac{5}{8} > \frac{3}{8}$.

$\frac{3}{8}$ is to the left of $\frac{5}{8}$ on the number line, so $\frac{3}{8}$ is less than $\frac{5}{8}$.

To show this comparison, write $\frac{3}{8} < \frac{5}{8}$.

H. Understand: The meaning of a unit fraction



A fraction is a number. When a whole is partitioned, or divided, into equal parts, a unit fraction represents the quantity, or amount, in one of those equal parts.

$$\frac{\text{numerator}}{\text{denominator}}$$

numerator ← number of equal parts in the fraction

denominator ← number of equal parts in the whole

A unit fraction has this form:

$$\frac{1}{\text{denominator}}$$

1 ← 1 equal part in the fraction

denominator ← number of equal parts in the whole

Each square has 1 equal part that is shaded.

Each square has 4 equal parts.

1 equal part in the fraction → 1
4 equal parts in the whole → 4

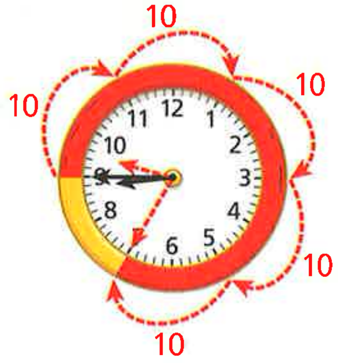
$$\frac{1}{4}$$

Read $\frac{1}{4}$ as "one fourth."

I. Understand: How to measure time intervals

The difference from one time to another time is called elapsed time.

Aaron swam from 8:45 A.M. to 9:35 A.M.
How long did Aaron swim?

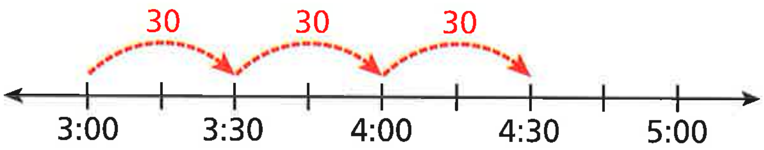


Look at the minute hand on the clock.
Count time intervals of 10 minutes.
10 + 10 + 10 + 10 + 10 = 50

Aaron swam for 50 minutes.

Practice for the school play was from 3:00 P.M. to 4:30 P.M.
How long was play practice?

Use a number line. Count time intervals of 30 minutes.

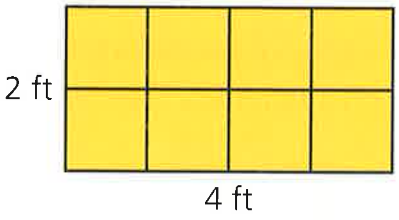


Remember!
60 minutes is 1 hour.

Play practice was 90 minutes, or 1 hour 30 minutes.

J. Understand: Multiply to find the area of rectangles

You can use different methods to find the area of a rectangle.



Method 1

Tile the rectangle.
Count the unit squares that will cover the rectangle.
The sides are measured in feet, so the area will be in square feet.

8 unit squares cover the rectangle.
The area of the rectangle is 8 square feet.

Method 2

Each unit square has an area of 1 square foot. There are 2 rows of unit squares.

Each row has an area of 4 square feet.

Multiply the side lengths of the rectangle.
$2 \times 4 = 8$
The area of the rectangle is 8 square feet.

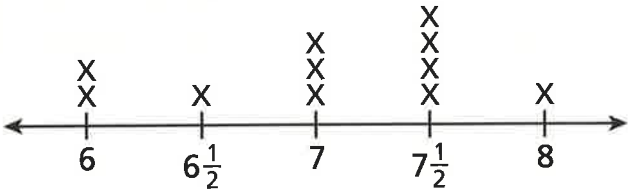
K. **Understand:** How to draw line plots

The tally chart shows lengths of carrots from Anya's garden.

Lengths of Carrots	
Length (in.)	Tally
6	II
$6\frac{1}{2}$	I
7	III
$7\frac{1}{2}$	IIII
8	I

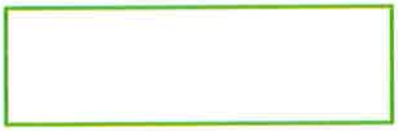
Use the tally chart to make a line plot of the measurement data.

Lengths of Carrots (in.)

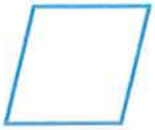


L. **Understand:** Use lengths of sides and angles to identify special quadrilaterals

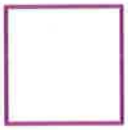
To identify a quadrilateral, look at the sides and the angles.



rectangle
opposite sides the same length
4 right angles



rhombus
all 4 sides the same length



square
all 4 sides the same length
4 right angles

A square has the attributes of both a rhombus and a rectangle.

Problem-Solving Model

You can use this model to solve problems.

Read

Read the problem.
Focus on the facts and the questions.

- What facts do you know?
- What do you need to find out?

Plan

Outline a plan.
Plan how to solve the problem.

- What operation will you use?
- Do I need to use 1 step or 2 steps?
- Will you draw a picture?
- How have you solved similar problems?

Solve

Follow your plan to solve the problem.

- Did you answer the question?
- Did you label your answer?

Check

Test that the solution is reasonable.

- Does your answer make sense? If not, review and revise your plan.
- How can you solve the problem a different way? Is the answer the same?
- How can you estimate to check your answer?

An Envelope Problem

Remember!

When you:	Use:
• Join like groups or quantities	$\square + \square = \square$
• Separate, or take away, from a group. • Compare two groups or quantities. • Find part of a group. • Find how many more are needed.	$\square - \square = \square$
• Join equal groups or quantities.	$\square \times \square = \square$
• Partition into equal shares. • Share a group equally.	$\square \div \square = \square$

Meg paints pictures and then puts them into envelopes. She puts 7 pictures into each envelope. How many envelopes does Meg need for 42 pictures?

Read

Visualize the problem as you reread it.
Focus on the facts and the question.

Facts: 7 pictures in each envelope
42 pictures

Question: How many envelopes does Meg need?

Plan

You are partitioning into equal groups.
The number of equal groups is unknown.

Divide: $42 \div 7 =$ ■
Think: ▨ $\times 7 = 42$

Solve

$42 \div 7 = 6$

➪ Meg needs 6 envelopes.

Check

Multiply to check division.
$6 \times 7 = 42$

A Recycling Problem

Tina, Maya, and Olga need to collect 200 aluminum cans to win a recycling contest. Tina has collected 57 cans, Maya has collected 76 cans, and Olga has collected 64 cans. How many more cans do the girls still need to collect?

Read

Visualize the problem as you reread it.
Focus on the facts and the question.

Facts: 200 cans needed.
Tina collected 57 cans.
Maya collected 76 cans.
Olga collected 64 cans.

Question: How many more cans are still needed?

Plan

Is more than one step needed to solve this problem? Yes.

Step 1: Find the number of cans collected. Add.

57	+	76	+	64	=	▨
Tina's cans		Maya's cans		Olga's cans		number of cans collected

Step 2: Find the number of cans the girls still need to collect. Subtract the sum from 200.

200	−	▨	=	▲
in all		number collected		number of cans still needed

Solve

57 + 76 + 64 = 197

The girls collected 197 cans.

200 − 197 = 3

The girls still need to collect 3 more cans.

Check

Use addition to check your answer.

197	+	3	=	200
cans collected		cans still needed		cans in all

Common Core State Standards for Mathematical Practice

The Standards for Mathematical Practice, identified here, are an important part of learning mathematics. They are covered in every lesson in this book.

MP1 **Make sense of problems and persevere in solving them.**

- Analyze and plan a solution
- Relate to a similar problem
- Assess progress
- Use concrete objects or pictures
- Check solutions

MP2 **Reason abstractly and quantitatively.**

- Pay attention to all mathematical language
- Represent problems using symbols
- Consider units in problem solving
- Use properties of operations and objects

MP3 **Construct viable arguments and critique the reasoning of others.**

- Analyze a problem situation
- Share reasoning with others
- Explain an approach to a problem
- Construct arguments by using drawings or concrete objects

MP4 **Model with mathematics.**

- Relate mathematics to everyday problems
- Make assumptions and estimations
- Explain the relationship of quantities
- Use concrete tools to explain operations
- Interpret the solution in the context of a situation

MP5 **Use appropriate tools strategically.**

- Consider the range of available tools (e.g., place-value charts, graphs, clocks, etc.)
- Decide on appropriate tools to use for each situation
- Use tools carefully and strategically

MP6 **Attend to precision.**

- Communicate with precision
- Identify the meaning of symbols
- Use measurement units appropriately
- Calculate accurately
- Carefully formulate full explanations

MP7 **Look for and make use of structure.**

- Search for patterns or structure
- Evaluate the structure or design of a problem
- Discuss geometric shapes in terms of their similarities and differences

MP8 **Look for and express regularity in repeated reasoning.**

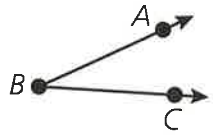
- Make generalizations in computation
- Obtain fluency using patterns
- Look for patterns with shapes and designs
- Use patterns to relate operations
- Evaluate reasonableness of answers

Key: MP = Mathematical Practice

Glossary

A

acute angle An angle that measures between 0° and 90°.



Angle *ABC* is an acute angle.

adjacent Sides of a polygon that are next to each other.

angle Formed when two rays share the same endpoint.

B

benchmark A known amount that can be used to compare or estimate other amounts.

C

compatible numbers Numbers that are easy to compute mentally.

complementary angles Two angles whose measures add to 90°.

composite number A number greater than 1 that has more than two factors.

For example, number 12.
The factors for 12 are 1, 2, 3, 4, 6, and 12.

customary units The measurement units used in the United States customary system of measurement.

D

data Facts or information.

decimal A number that uses place value and a decimal point.

decimal point Separates the whole-number part and the part that is less than 1 in a decimal.

$$\underset{\text{decimal point}}{0\underset{\uparrow}{.}7}$$

decompose fractions Breaking apart a fraction by writing it as a sum of other fractions with the same denominator.

degree (°) The unit of measure for angles.

dividend The number being divided.

divisor The number by which the dividend is divided.

E

endpoint The point at either end of a line segment or the starting point of a ray.

equivalent fractions Fractions that have different names, but are at the same point on the number line.

For example, $\frac{1}{4} = \frac{2}{8}$

expanded form A number expressed in a way that shows the value of each digit.

For example,

$$\begin{array}{cccccc} \mathbf{2} & \mathbf{9} & , & \mathbf{0} & \mathbf{3} & \mathbf{5} \\ \downarrow & \downarrow & & \downarrow & \downarrow & \downarrow \\ 20{,}000 & 9{,}000 & & 0 & 30 & 5 \end{array}$$

$$29{,}035 = 20{,}000 + 9{,}000 + 30 + 5$$

F

factor One of the two or more numbers that are multiplied to form a product.

factor pair Two numbers that multiply to give a product.

formula A mathematical rule that is expressed with symbols.

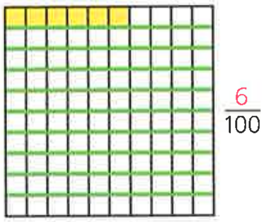
For example, $P = 2\ell + 2w$ is the formula for finding the perimeter of a rectangle.

fraction A number that names part of a whole, an area, or a group. It can be expressed in the form $\frac{a}{b}$.

H

hexagon A polygon with 6 sides and 6 angles.

hundredth Each part of a whole when the whole is partitioned into 100 equal parts.



The figure shows $\frac{6}{100}$.

L

length How long something is.

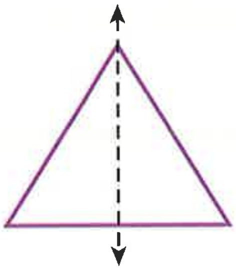
For example, the measure of each side in the longer pair of opposite sides of a rectangle, is called the length of the rectangle.

like denominators The denominators of two or more fractions that are the same.

For example, in $\frac{3}{8} + \frac{1}{8} = \frac{4}{8}$ the fractions have like denominators.

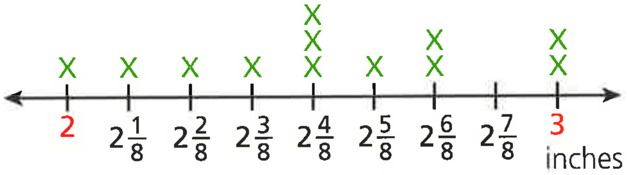
line An endless collection of points along a straight path.

line of symmetry The line that is formed when a figure is folded into two parts that match exactly.



line plot A graph used to organize a set of data on a number line, with symbols to represent the data.

Maple Leaf Lengths



line segment Part of a line that has two endpoints.

M

metric units The measurement units used in the metric system of measurement.

mixed number A number that shows the sum of a whole number and a fraction but does not have a + sign.

For example, $4\frac{1}{2}$

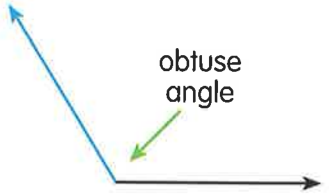
multiple The product of a given whole number and another whole number.

N

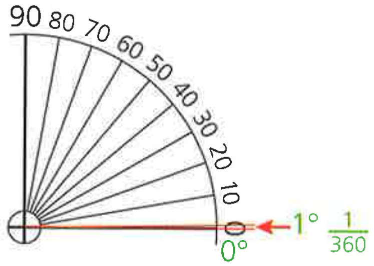
number pattern An ordered list of numbers that follow a rule and repeat or change in some way.

O

obtuse angle An angle that measures between 90° and 180°.



one-degree angle An angle that turns through $\frac{1}{360}$ of a circle.



P

parallel lines Lines that will never meet, or intersect.

parallelogram A quadrilateral in which both pairs of opposite sides are parallel.

partial products Numbers that are formed by multiplying the value of each digit by a factor.

pattern rule Tells the term to start with and how to find the next term in a number or shape pattern.

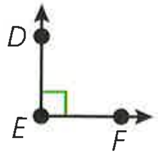
pentagon A polygon with 5 sides and 5 angles.

period Every group of 3 places in a place-value chart.

This place-value chart shows the Thousands period and the Ones period.

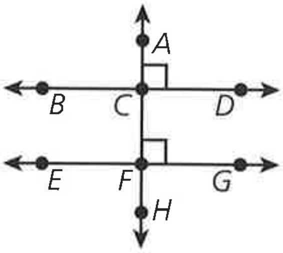
Thousands			Ones		
hundreds	tens	ones	hundreds	tens	ones
	2	9	0	3	5

perpendicular Two lines, line segments, or rays that meet or intersect to form a 90° angle.



In the figure, rays *ED* and *EF* are perpendicular.

perpendicular lines Lines that meet, or intersect, to form a right angle.



In the figure, lines *AH* and *BD* are perpendicular lines.

point An exact location in space.

prime number A number greater than 1 with only two factors, 1 and the number itself.

For example, 7 and 13 are prime numbers.

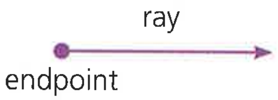
protractor A tool used to find the exact measure of an angle.

Q

quotient The result when two numbers are divided.

R

ray The part of a line that starts at an endpoint and goes on in one direction forever.



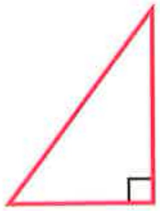
rectangle A parallelogram with two pairs of perpendicular sides.

remainder The amount left over after dividing.

For example, $52 \div 6 = 8$ R4
"52 divided by 6 equals 8 remainder 4."
The amount left over after dividing is 4.

right angle An angle that turns through $\frac{90}{360}$, or $\frac{1}{4}$, of a circle. It measures 90°.

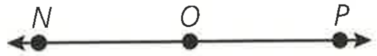
right triangle A triangle with one right angle and two acute angles.



S

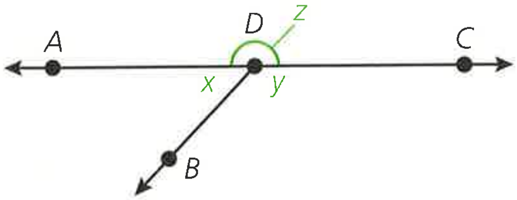
shape pattern An ordered sequence of shapes that follows a rule.

straight angle An angle that turns through $\frac{180}{360}$, or $\frac{1}{2}$, of a circle. It measures 180°.



In the figure, angle *NOP* is a straight angle.

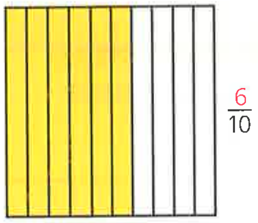
supplementary angles Two angles whose measures add to 180°.



In the figure, angle *ADB* and angle *CDB* are supplementary angles.

T

tenth Each part of a whole when the whole is partitioned into 10 equal parts.



The shaded part of the figure shows $\frac{6}{10}$.

term Each number or shape in a number or shape pattern.

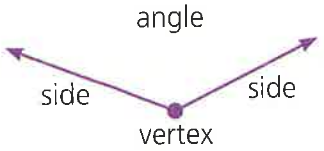
trapezoid A quadrilateral that has at least one pair of parallel sides.

U

unit fraction Represents the quantity, or amount, in one of the equal parts of a whole when the whole is partitioned, or divided.

V

vertex The shared endpoint of two rays that form an angle.



W

width How wide something is.

For example, the measure of each side in the shorter pair of opposite sides of a rectangle, is called the width of the rectangle.

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